ABSTRACTS

	PAGE
OILFIELD EXPLORATION AND EXPLOITATION	
Geology	2 A
Geophysics and Geochemical Prospecting	3 A
Drilling	4 A
Production	5 A
TRANSPORT AND STORAGE	6 A
REFINERY OPERATIONS	
Refineries and Auxiliary Refinery Plant	7 A
Distillation	8 A
Absorption and Adsorption	8 A
Solvent Extraction and Dewaxing	8 A
Cracking	9 A
Hydrogenation	9 A
Polymerization	9 A
Alkylation	10 A
Isomerization	10 A
Chemical and Physical Refining	10 A
Special Processes	10 A
Metering and Control	10 A
PRODUCTS	
Chemistry and Physics	11 A
Analysis and Testing	12 A
Gas	13 A
Engine Fuels	13 A
Lubricants	13 A
Bitumen, Asphalt, and Tar	13 A
Special Hydrocarbon Products	13 A
Derived Chemical Products	13 A
Coal, Shale, and Peat	14 A
Miscellaneous Products	14 A
CORROSION	14 A
ENGINES AND AUTOMOTIVE EQUIPMENT	14 A
SAFETY PRECAUTIONS	14 A
MISCELLANEOUS	14 A
BOOK REVIEWS	15 A
ADDITIONS TO THE LIBRARY	16 A

AUTHOR INDEX

The numbers refer to Abstract Numbers

Ackermann, —, 83
Ahlers, N. H. E., 117
Alexander, C., 64
Allied Chemical and Dye Corpn., 78
Andrews, H., 75
Armentrout, A. L., 39
Aronofsky, J. S., 32
Arps, J. J., 30
Atkinson, R. G., 64
Atlantic Refining Co., 71

BASF AG., 77
Baker Oil Tools Inc., 28
Baker, R. C., 28
Banks, G. L., 88
Baral, L. L., 76
Barnes, H., 8
Barnwell, G. F., 29
Baumann, G. P., 82
Bayerlein, —, 81
Berg, C. H. O., 64, 69, 76
Bergman, D. J., 64
Bergman, G., 115
Bergstrom, E. V., 76
Bergstrom, F. S., 28
Bielak, E. B., 89
Bills, J. L., 76
Blomén, —, 81
Bluschke, H., 84
Böcker, A., 51
Bonn, —, 112
Bouman, C. A., 31
Boyd, D. M., 68
Brandel, A. J., 81
Brauer, W., 28
Brennan, G. L., 53
Broese, J. J., 91
Brown, C. C., 28
Büchner, —, 112
Bukowiecki, A., 98

California Research Corpn., 81
Carsola, A. J., 12–13
Chalk, A. J., 88
Charnyi, I. A., 38
Chem. Fabr. Badenia Keilman OHG., 110
Chem. Werke Bergkamen AG., 83
Cigmic, N., 26
Clark, R. C., 22
Clarke, E. W., 71
Coffer, H. F., 22
Cole, J. A., 108
Collin AG., F. J., 69, 81
Collins, A., 57
Conn, A. L., 74
Croy, —, 110

Daimler, —, 110
Davison Chemical Corpn., 76
Dawson, J. E., 88
Deanesly, R. M., 76
Deering, R. G., 44, 59
de Graaf, J. E., 94
Deutsche Gold- und Silber-Schiedeanstalt, 95
de Witte, L., 24
Dickey, P. A., 10
Dierichs, —, 112
Dinerstein, R. A., 81

Early, J. V., 75
Engelhardt, —, 77
Erchak, M., 78

Farbwerke Hoechst AG., 110, 112
Felts, W. M., 9
Findlay, R. A., 68
Findlay, R. H., 64
Fontana, F. J., 81
Forrester, J. H., 74
Foulkes, G. E., 52
Free, —, 77

Gable, G. M., 68
Gassaway, J. S., 28
Gelsenkirchener Bergwerks AG., 110
Gjurdevic, D., 102
Gleason, A. H., 78
Gleim, W. K. T., 81
Goering, H. G., 78
Göhre, —, 77
Goymann, —, 83
Graf, —, 112
Grant, L. F., 6
Gross, —, 76
Gruschke, —, 112
Gulf Research and Development Co., 79
Gunning, S. D., 28

Hagemann, —, 106
Hahn, —, 103
Halbouty, M. T., 5
Hardin, G. C., Jr., 5
Headrick, J. F., 119
Heater, W. E., 29
Hedberg, H. D., 1, 29
Herbert, —, 76
Herzog, G., 17
Hibard, G. G., 28
Hill, R. W., 63
Hines, J. E., 69
Hofmeister, —, 69
Holthaus, —, 69
Holtmann, —, 110
Houdry Process Corpn., 76
Howard, G. C., 34
Hunt, A. D., 11
Hunt, J. M., 10
Hunter, E. E., 123
Hurley, T. F., 116

Jenkins, R., 32

Kadmer, E. H., 97
Kalb, —, 103
Kane, D., 39
Kennedy, R. M., 79
Kent, P. E., 15
Kenworthy, C. S., 45
Kestner, R. S., 50
Killer, M., 35, 99
Kloepfer, —, 95
Klotz, R. L., 19
Kölbel, —, 77, 83
Kölbel, H., 85
Kolling, —, 112
Koppers G.m.b.H., 103, 112

Lahee, F. H., 21
Lane–Wells Co., 28
Langenheim, R. L., Jr., 7
Lawrenz, R. A., 75
Lea, P. J., 28
Leary, R. F., 78
Leavenworth, M., 62
Lee, B. D., 17
Le Roi Co., 28
Lien, A. P., 71, 80
Linderoths Patenter AB., 81
Löpmann, —, 83
Loy, M. E., 23
Luchter, A., 4
Lupfer, G. L., 68

McCaulay, D. A., 71, 80
McClure, W. L., 64
McFatter, W. E., 73
Madruck-Ges für Maschinelle Druckentwasserung m.b.H., 83
Malloy, J. B., 74
Mardics, E. W. J., 89
Maretic, M., 101
Martin, C. W., 48
Mason, J. F., 29
Matheson, G. L., 76
Metallges. AG., 69, 76
Miladinovic, M., 16
Millikin, B. T., 33
Mills, G. A., 76
Milne, A. A., 108
Moneymaker, B. C., 6
Moore, D. G., 2
Moore, T. V., 28
Müller, —, 69
Mullins, B. P., 93

Newchurch, E. J., 69
Newton, C. E., 57
Niclause, M., 87
Niementowska, I., 54
Norris, D. E., 76
North, H. C., 68
Northrup, M. S., 68

Oettinger, —, 77
Offutt, W. C., 79
Oliver, J., 62
Olson, W. S., 14
O'Neill, L. A., 117
Osmun, F. W., 28

Parker, E. H., 49
Penner, S. S., 92
Phillips Petroleum Co., 28, 64, 68
Picardi, E. A., 58
Pier, —, 77
Pinfold, E. S., 37
Poupon, A., 23
Prange, F. A., 119
Pratt, H. R. C., 70
Price, N., 40
Pryor, R. C., 28

Reasoner, M. A., 11
Redlich, O., 68
Reed, P., 42–3, 46, 59
Resen, F. C., 60
Resen, F. L., 73
Reynaud, P., 107
Reynolds, J. J., 22
Rheinpreussen AG., 77, 83
Richfield, Oil Corpn., 81
Riffer, D., 56
Rocca, J. P., 78
Roelen, —, 112
Rottig, —, 112, 114
Ruhrchemie AG., 106, 112, 114
Runge, F., 86
Ruschenberg, E., 85
Rush, E. E., 64

Schäfer, H., 109
Schiewitz, —, 81
Schlumberger, —, 110
Schmalenbach, —, 112
Schmitz, —, 114
Schneider, A., 79
Schorre, C. E., 41
Schulz-Methke, H. D., 96
Schutte, A. H., 76
Schweitzer, P. H., 121
Schwenke, —, 83
Scott, P. P., 34
Sef, V., 101
Seismograph Service Corpn., 19
Sellers, E. S., 72
Shell Development Co., 68
Shepard, F. P., 2
Smith, J. F., 88
Smith, M. B., 82
Socony-Vacuum Oil Co., 19, 76
Spiske, —, 112
Standard Oil Co., 68, 71, 80–81
Standard Oil Development Co., 28, 68–9, 76, 78
Stanley, W. E., 81
Starr, C. E., 69
Stetter, —, 112
Stewart, F., 10
Stoller, —, 81
Strauss, —, 81
Sun Oil Co., 64, 79
Sutton, W. J., 39

Tachilzik, R., 47
Templeton, C. C., 36
Texas Co., 17
Tippit, J. J., 57
Tixier, M. P., 23
Tokarski, A., 3
Tramm, —, 112
Trotter, C. H., 57
Turechek, G. F., 28

Union Oil Co. of California, 69, 76
Universal Oil Products Co., 64, 68, 76, 81

van der Waarden, M., 90
Vann, J. O., 19
Veletic, S., 40
Verkaufsvereinigung für Teererzeugnisse AG., 106
Verstappen, J. J., 113
Vogel, —, 110
von Estorff, F. E., 29
von Füner, —, 77

Wacker-Chemie G.m.b.H., 103
Ward, J., 75
Warren Petroleum Corpn., 53
Waterman, H. I., 113
Welch, L. M., 78
Whaley, T. H., 64
Wierzchowski, T., 25
Wilson, C. P., 76
Wilson Supply Co., 39
Winberg, H. T., 104
Wisfeld, —, 69
Wojnar, J., 118

Yost, W. J., 19

Zepf, K., 86
Ziegler, —, 79, 114
Zosel, —, 79
Zublin, J. A., 28

OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

1. World oil prospects—from a geological viewpoint. H. D. Hedberg. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1714.—In view of the ever-increasing volume of oil production, paralleled as it is by the increase in the world's known oil reserves, the author considers it timely to review future likely trends. He concludes that discovery and evaluation of the world's oil resources will come principally through co-ordinated and well-calculated efforts in the fields of geology, land acquisition, and engineering, under the auspices of enterprising and intelligent management. E. N. T.

2. Sedimentary environments differentiated by coarse-fraction studies. F. P. Shepard and D. G. Moore. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1792.—A description is given in this paper of a simple non-technical system of characterizing sediments. In this the coarse fraction of each sample (the part greater than $\frac{1}{8}$ mm in dia) is sieved and the percentages of the significant constituents in each sieving are estimated from binocular examination of the subdivisions. The findings are then compiled into diagrams and averaged for groups of similar sediments.

This method seems to provide one of the best means of differentiating modern environments, and gives important evidence of distances from shore and water depths. It is thought that this method could be applied to help differentiate environments of ancient sediments. E. N. T.

3. Surface survey of (geological) structures. A. Tokarski. *Nafta (Krakow)*, 1953, **9**, 264–7.—The geologist has at his disposal the information revealed by local digging and manual drilling, but in the Carpathians it is important to choose the locality for such operations so as not to waste expenses when information can often be gained from keen surface observations. The Carpathians are built up of long unbroken undulating anticlines, and often eroded formation farther along will reveal the required information. When shallow drilling is decided upon, the choice of locality should be made from the point of view of the actual information required, and not according to a pre-arranged method. The author's own experience in the analysis of the "Bednarka loop" on the borders of Jaslo and Gorlice areas showed that the formations exposed by a stream in its valley are quite enough to identify the whole structure. Thus great savings can be achieved in the search for oil in that region. M. S.

4. Rôle of bacteria in the formation of petroleum. A. Luchter. *Nafta (Krakow)*, 1953, **9**, 290–2.—Of the several theories on the origin of petroleum one suggests a contribution to it from bacteria. Some strains can live at up to 65° C, others at high pressure in saturated soln of salts and without oxygen. Certain rocks from Baku II contained more than 10^8 cells/g. Those which had none were all non-oil-bearing. Further weight is given to the theory by comparison of C–H, C–O, and C–N ratios in organic residues of various ages found at the bottom of the sea. In absence of air many bacteria produce methane, but some gave carotenes and similar compounds ($C_{40}H_{56-58}$) or mixtures of C_{19}–C_{25}. Tauson maintains that SO_4^{--} can be bacterially reduced to S^{--} at the expense of hydrocarbons. Thus in presence of SO_4^{--} paraffins will be changed into *cyclo*paraffins. Conditions suitable for growth of such bacteria were investigated by ZoBell, Rittenberg, Jankowski, Szturm, and others. M. S.

5. New exploration possibilities on piercement-type salt domes established by thrust fault at Boling salt dome, Wharton County, Texas. M. T. Halbouty and G. C. Hardin, Jr. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1725.—The South Boling oilfield is structurally a closure on the down-thrown side of a thrust fault occurring on the south flank of the Boling piercement-type salt dome, Wharton County, Texas, *ca* 50 miles SW. of Houston. The field is situated in the Frio trend of the upper Gulf Coast of Texas, and is approx on strike with such prolific Frio formation oilfields as Friendswood and Hastings.

The main significance of the South Boling field is in the unique controlling structural feature for the accumulation, as many such fields may hitherto have been overlooked by the use of the conventional Gulf Coast geologic approach.

Some wells penetrated as much as 1000 ft of overthrust Jackson (Eocene) shale before reaching the younger Frio (Oligocene) beds below the plane of the thrust fault; 10 productive Frio sands and one productive *Marginulina* sand have to date been established in the field. E. N. T.

6. Cretaceous and Pleistocene section in northern end of Mississippi embayment. B. C. Moneymaker and L. F. Grant. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1741.—The results of detailed geologic investigations of a steam-plant site are given in this paper, which involved the study and sampling of 304 ft of unconsolidated sediments in a small area in the northern end of the Mississippi Embayment. Information was obtained on the local character of the bedrock floor upon which Upper Cretaceous sediments were deposited, as well as detailed data on the character of the Upper Cretaceous and Pleistocene sediments.

A basal Upper Cretaceous gravel previously assigned to the Tuscaloosa formation, although not everywhere present, is believed to be of late Selma or early Ripley age. E. N. T.

7. Correlation of Maroon formation in Crystal River valley, Gunnison, Pitkin, and Garfield Counties, Colorado. R. L. Langenheim, Jr. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1748.—The most significant Upper Paleozoic lithogenetic units are the Gothic and Maroon formations between Copper Creek and Glenwood Springs, Colorado. Although thin limestones were traced southward from Glenwood Springs to Redstone which furnish local horizons of time-rock correlation, they do not mark the limits of useful lithogenetic units.

About 2000 ft below the pre-Jurassic unconformity near Carbondale occur the projected horizons of the Schoolhouse sandstone and the South Canyon Creek dolomite, where their position is occupied by laterally equivalent redbeds.

Restriction of the Central Colorado basin in the Treasury Mountain dome area is indicated by basal conglomerate in the Belden shale, abundant reworked Pennsylvanian rocks and marked thinning in the Maroon formation, non-deposition of marine tongues within this formation, and a pre-Jurassic structural high. E. N. T.

8. Age and stratigraphic relations of Ignacio quartzite in Southwestern Colorado. H. Barnes. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1780.—Recent field investigations in the SW. area of Colorado suggest that the Ignacio quartzite is Devonian in age and not, as has previously been supposed, of Late Cambrian age.

Earlier investigations had indicated that the Late Cambrian had been disconformably overlain by the Elbert formation of Late Devonian age, and everywhere underlain by eroded older rocks. This paper, however, discusses the possibility that the area is Devonian in age, and that it forms an essentially continuous depositional sequence with the overlying Elbert formation and Ouray limestone, and that in the Animas River Valley the Ignacio has been intruded by a granite porphyry of Devonian or younger age. E. N. T.

9. Occurrence of oil and gas and its relation to possible source beds in Continental Tertiary of Intermountain region. W. M. Felts. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1661.—This paper discusses the general stratigraphic and geological factors having a direct bearing on the oil and gas occurrences in the Intermountain region.

There are considerable volumes of Tertiary continental sediments within the intermontane basins of the Intermountain region, the Great Basin, and the Columbia Plateau, and these may be classified on the basis of depositional loci into 2

general categories: (1) suites of sediments deposited in large lakes which in their later histories became saline; and (2) basin fills of fluvial, paludal, and fresh water lacustrine beds associated with varying amounts of extrusive volcanics.
E. N. T.

10. Origins of hydrocarbons of Uinta basin, Utah. J. M. Hunt, F. Stewart, and P. A. Dickey. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1671.—The source rocks of the Uinta basin were identified with certainty by a combination of geological and chemical studies using more than 2000 outcrop and subsurface rock and hydrocarbon samples, this being made possible by the complete exposures of both source and reservoir rocks and the wide range in the chemical composition of the hydrocarbons they contain.

The Eocene sediments of the Uinta basin consist of fluvial and deltaic red and green shales and sands around the margins of the basin, and bituminous siliceous dolomites in the centre. Asphalts and oils ooze from outcrops of the Eocene and are found in joints, veins, fissures, crystal cavities, and in pores of sandstones.

Each of the 4 chemically different types of free hydrocarbons is found to be closely associated with one particular stratigraphic unit, thus enabling the source rock of each type to be identified.

It was found that the changes in the chemical character of the hydrocarbons are correlative with lithologic changes, and therefore appear to be due to changes in depositional environment, but there is no evidence that the differences in the hydrocarbons are a result of metamorphism, cat cracking, or depth of burial.
E. N. T.

11. Structure of Coleville–Buffalo Coulee Area, Saskatchewan. M. A. Reasoner and A. D. Hunt. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1534.—This is the first detailed paper on the Coleville–Buffalo Coulee area to be published, and sufficient data have been collected to help elucidate one of the geological problems throughout Saskatchewan. The area is one of considerable economic important due to the discovery of large reserves of oil and gas.

Contour maps, a paleogeological map, and cross-sections are presented to demonstrate the structure of the area. All structures observed in the uppermost Devonian and Lower Mississippian strata are attributed to leaching of a thick Upper Devonian anhydrite member with consequent collapse of overlying beds.

The Lower Paleozoic structure is briefly discussed, and an outline is given of the drainage pattern of an old land surface developed by a post-Mississippian erosional period. It is thought that unconformable contact between the Mississippian Coleville sand and Cretaceous shale probably accounts for the entrapment of oil in the sand.
E. N. T.

12. Recent marine sediments from Alaskan and Northwest Canadian Arctic. A. J. Carsola. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1552.—The author describes and interprets the sediments of this region in the light of the new data obtained during the Beaufort Sea Scientific Expeditions in 1950 and 1951, sponsored by the U.S. Navy, to a hitherto virtually unexplored region of the N. Polar Sea.

Methods of analysing the samples obtained are given, together with tables showing the size distribution of sediments and the decomposable organic matter in Arctic sediments.

Mud covers the slope and most of the shelf, on which the sediments are poorly sorted and in many places contain large amounts of sand or stones. The sediments become better sorted, and average grain size decreases with increasing depth and distance from shore. The sediments appear to be highly oxidized in spite of what is probably a fairly rapid rate of deposition. Physical and chemical conditions in the water apparently permit oxidn of most oxidizable organic material before it reaches the bottom, thus making the sediments abnormally low in organic carbon, despite a high organic production during the growing season.
E. N. T.

13. Microrelief on Arctic sea floor. A. J. Carsola. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1587.—The upper continental slope in the Arctic Ocean off Alaska and NW. Canada is characterized by a series of low mounds and troughs. Microrelief is found almost everywhere on the upper continental slope in the Chukchi Sea and in the W. Beaufort Sea between depths of 30 and 200 fathoms. The pits and mounds of the microrelief areas are in places 60 ft from bottom of depression to top of rise, but usually the relief is only 6–30 ft.

The origin of the microrelief is difficult to determine at this time, and the author discusses 5 hypotheses for consideration. They are: (1) glacial deposition, moraines, etc.; (2) grounding of sea ice and icebergs; (3) sea ice melt deposits; (4) surface permafrost features; and (5) mass movement.
E. N. T.

14. Source-bed problem in Velasquez field, Colombia. W. S. Olson. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1645.—The Velasquez oilfield in the Middle Magdalena Valley, Colombia, is a long, narrow, Tertiary basin. The sedimentary section consists of approx 8000 ft of clastic continental beds which rest directly on a crystalline basement, and these Tertiary beds increase as much as 4-fold in thickness toward the SE., without any evidence for marine intercalations.

The writer believes that the source of oil and salt water in the continental sediments of this field was in the marine Cretaceous sediments which lay unconformably below the continental beds some miles east.
E. N. T.

15. Oil occurrences in coal measures of England. P. E. Kent. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1699.—Oil showings in the Lancashire and the E. Midland coal fields are common, and those of the latter are reviewed in detail in this paper.

The coal measures (Pennsylvanian) of Britain consist mainly of non-marine strata, supposed to be fresh water, with subordinate marine intercalations which are largely restricted to the upper and lower parts.

It is noted that all the showings are of limited size, despite abundant favourable trap structures, suggesting that the non-marine shales have only limited potentialities for oil generation.
E. N. T.

16. Preliminary report on geological investigations in the territory of Rumije. M. Miladinovic. *Nafta (Yugoslavia)*, 1954, **5** (5), 131–6.—Rumia district occupies SE. part of Adriatic littoral, and from geological point of view is not completely investigated. In this county the Permian beds, then the beds of all the members of Triassic, middle and upper Jurassic and Eocene flysh are determined. In Permian shales as Sustasi, near Bar, fossils of great importance have been found. From igneous rocks, prophyrites have been found, which occur as smaller and larger mass. From the tectonics point of view it is possible to distinguish 2 zones. First is the front zone, in which characteristic imbricate structures occur. The second zone is one which is made of Rumia limestone in the shape of a sheet with a rather broken structure. Imbricate structure is determined at Virpazar, Sutorman, and Stari Bar. The greatest overlapping plate (shingle) lies on the front part of Rumia and is called Lisinj. Overlapping plate at Lisinj lies over Eocene flysh, and consists of Upper Triassic limestone. It is believed that the Rumia district folded during Sava Orogene phase.
(Author's abstract.)

17. Patent. U.S.P. 2,683,563 (8.7.50; 13.7.54). B. D. Lee and G. Herzog, assrs to Texas Co. Method of operating potentiometric models.
J. M. S.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

18. Development of the seismographic searching methods in U.S.S.R. Anon. *Nafta (Krakow)*, 1953, **9**, 280.—First work on earthquakes by Lomonosov appeared in 1757. B. B. Golicyn founded the seismographic searching methods, and

his co-workers perfected them. About 1926–29 the refraction method was used to locate oil in the Grozny region. In 1934 the reflection method was used to locate oil nr Lake Balkay and in Bashkiria region. Recent work led to the discovery of Devonian reservoirs. M. S.

19. Patents. U.S.P. 2,683,414 (7.5.47; 13.7.54). R. L. Klotz, assr to Seismograph Service Corpn. Arrangement to ensure complete detonation of explosive charges.

U.S.P. 2,683,867 (11.6.51; 13.7.54). J. O. Vann. Parachuted radio seismic transducer.

U.S.P. 2,685,058 (27.8.59; 27.7.54). W. J. Yost, assr to Socony-Vacuum Oil Co. Geophysical exploration by electric pulses. J. M. S.

DRILLING

20. Oil industry. Anon. *Nature, Lond.*, 1954, **174**, 299.—An elementary account of developments in drilling techniques from 1859 to the present day. H. C. E.

21. Exploratory drilling in 1953. F. H. Lahee *et al.* *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 971.—This is the 9th annual report on data gathered by the A.A.P.G. committee on statistics of exploratory drilling. Statistics are given for the whole of the U.S.A., Canada, and Mexico.

Of the 13,313 exploratory holes drilled during 1953 in the U.S.A., 6925 were new-field wildcats, 3358 were new-pool tests, and 3030 were outposts. The number of successes were as follows: 774 new-field wildcats; 924 new-pool tests; and 982 outposts.

In Canada, 989 exploratory holes were drilled, of which 267 were successful. In Mexico, 128 exploratory holes were drilled, and of these 59 were successful. E. N. T.

22. Ten-pound cement slurry for oil wells. H. F. Coffer, J. J. Reynolds, and R. C. Clark. *J. Petrol. Tech.*, 1954, **6** (6), AIMME Tech. Paper No. 3801, 35–7.—Difficulties arising from lost returns in cementing because of high-density cement slurries have led to a search for lighter slurries. Large amounts of water greatly reduce set cement strength, and laboratory work has been done on an additive of small clay bubbles of air having sufficient strength to resist crushing at bottom-hole pressures. By this means slurries of 10–12 lb/gal are possible, and these have greater strength than cements of over 12 lb/gal with perlite or bentonite, as well as being cheaper. The clay bubbles also tend to prevent loss of slurry into zones of lost circulation. The set cement is somewhat porous, and should have good perforating characteristics by reducing shattering, although allowing increased penetrability by bullets or shaped charges. Clay bubble cement is relatively impermeable. Field tests are being planned. G. D. H.

23. Contribution to electrical log interpretation in shaly sands. A. Poupon, M. E. Loy, and M. P. Tixier. *J. Petrol. Tech.*, 1954, **6** (6), AIMME Tech. Paper No. 3800, 27–34.—Methods are suggested for the qualitative interpretation of electric logs in shaly sands, based on theoretical and experimental studies made by various investigators, and on results observed in the field. A quantitative analysis is given. A semi-log plot of R_{xo}–R_t against the pseudo-static SP gives interesting qualitative information on the presence or absence of hydrocarbons in a shaly sand (R_{xo}—resistivity of invaded zone adjacent to borehole; R_t—true resistivity of formation). The presence of hydrocarbons in shaly sands can often be recognized qualitatively by comparing R_t with the product of F_a, an apparent formation factor given by the microlog, and R_{wa}, an apparent connate water resistivity obtained from the SP curve. In order to apply the methods discussed increased accuracy will be needed in logging methods. G. D. H.

24. Resistivity logging in thin beds. L. de Witte. *J. Petrol. Tech.*, July 1954, **6** (7), AIMME Tech. Paper No. 3803, 29–35.—The data provided by the usual short and long normal, and one or more long lateral logs are inadequate for complete quantitative interpretations in beds thinner than 20 ft. Reservoir rocks often have zones of limited thickness for which the long lateral curves are useless because of adjacent bed and boundary effects. Qualitative interpretation is possible via the short and long normals for beds 12 ft or more in thickness, and this can be aided by the use of simplified departure curves. Even this procedure is invalid for beds of thickness less than twice the long normal spacing. If the mud resistivity and hole dia are known with sufficient accuracy beds at least 10 ft thick can be quantitatively studied by combining the limestone curve, lateralog, and microlateralog. For beds under 10 ft thick combinations of microlateralog with short-spaced and pseudo lateralogs seem promising, the interpretation requiring simplified departure curves. A field example of this last technique is given. G. D. H.

25. Hardening using oxy-acetylene flame. T. Wierzchowski. *Nafta* (*Krakow*), 1953, **9**, 257–8.—Steels with 0·4–0·6% C and 0·15–0·18% V may be hardened by rapid application of heat and cooling. A specially shaped nozzle will apply in quick succession the oxy-acetylene flame, a jet of air (for first cooling), and a jet of water.

The nozzle may be moved at *ca* 10–20 cm/minute. Cooling in an oil bath at 175° C for ½–4 hr follows. The thickness of the hard surface is only 5 mm. These features make this method very useful for equipment used in the oil drilling operations in the field. M. S.

26. Oil well MB 31 completed with success even against complicated working conditions. N. Cizmic. *Nafta* (*Yugoslavia*), 1954, **5** (6), 159–65.—The deep exploratory well MB 31 was located on the western part of the Mramor Brdo structure, with the aim of investigating the existence of crude oil in its Abichi and Prevalencienesian layers. After completing drilling and examination, the following geological profile was stated: to 330 m—paludina layers; 330–660 m—rhomboidea layers; 660–1200 m—Abichi layers; 1200 m and further—Prevalencienesian layers. The drilling was completed in the Prevalencienesian layer at 1570, 7 m after stagnant under-water was found. In the Abichi layers, 3 sandy layers, containing crude oil A, B, and C, were stated. The upper part of the Prevalencienesian layers showed dark, very brittle, and crumbled lime-marl and proved oil-bearing. (Author's abstract.)

27. Association of Engineers and Technicians of Petroleum Industry—conference at Sanok. Anon. *Nafta* (*Krakow*), 1953, **9**, 285–6.—On the subject of drilling muds. It has been decided to press for more research and instructions by means of coordination of information and central technical establishment. M. S.

28. Patents. U.S.P. 2,683,021 (30.9.48; 6.7.54). W. Brauer. Tool for drilling an annulus around a casing in a well bore.

U.S.P. 2,683,490 (19.12.49; 13.7.54). C. C. Brown. Well packer.

U.S.P. 2,683,491 (1.6.51; 13.7.54). J. S. Gassaway, assr to Baker Oil Tools Inc. Scratcher for well bores.

U.S.P. 2,683,492 (11.9.51; 13.7.54). R. C. Baker, assr to Baker Oil Tools Inc. Subsurface well tool.

U.S.P. 2,683,586–8 (28.4.49, 6.8.51, 16.10.51; 13.7.54). S. D. Gunning, assr to Le Roi Co. Drilling rigs.

U.S.P. 2,683,786 (12.1.50; 13.7.54). G. F. Turechek, assr to Lane-Wells Co. Multi-shot controller for perforating guns.

U.S.P. 2,684,118 (12.10.51; 20.7.54). F. W. Osmun. Safety support for line-suspended well equipment.

U.S.P. 2,684,119 (20.6.49; 20.7.54). C. C. Brown. Well packer.

U.S.P. 2,684,120 (16.8.51; 20.7.54). C. C. Brown. Casing scraper.

U.S.P. 2,684,229 (6.9.51; 20.7.54). F. S. Bergstrom. Exploration drilling apparatus.

U.S.P. 2,684,575 (22.12.50; 27.7.54). R. C. Pryor and G. G. Hibard, assrs to Phillips Petroleum Co. Submersible type offshore drilling structure.

U.S.P. 2,684,581 (6.11.51; 27.7.54). J. A. Zublin. Flexible jointed drill pipe.

U.S.P. 2,684,720 (29.8.49; 27.7.54). P. J. Lea, assr to Phillips Petroleum Co. Aq slurry of hydraulic cement containing an alkali metal, alkaline earth metal, magnesium or ammonium lignin sulphonate, and an alkali metal hydroxide or salt is used for cementing wells.

U.S.P. 2,684,835 (26.7.50; 27.7.54). T. V. Moore, assr to Standard Oil Development Co. Drill bit assembly.

J. M. S.

PRODUCTION

29. 1953 developments in foreign petroleum fields. 1. South America and Caribbean. J. F. Mason. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1396.—During 1953 new records were again set in nearly all countries in S. America for crude production. In Venezuela there was a decrease in the total number of wells drilled, but the country maintained its position as the dominant oil-exporting country of the W. Hemisphere. Colombia, Argentina, and Chile increased their production from previous years, but Peruvian production dropped by 2%. The largest proportional rise in production was in Chile, with a rise of 39%.

The annual crude production from S. America, including Trinidad, was 756,704,744 brl, a decrease of 10,058,281 brl from 1952.

2. Europe. F. E. von Estorff. 1954, **38**, 1434.—The daily average of petroleum production in W. Europe was 67,360 brl, Germany being the highest producer with a daily production of 42,000 brl.

11 new oilfields and 3 gas fields were discovered in W. Germany, 2 oilfields and one gas field in the Netherlands, and one new oilfield in Great Britain.

A total of 149 exploratory wells were completed during 1953, being 68·2% successful. 93% of development wells completed were successful. The total production in Europe was 24,580,732 brl, an increase over 1952 of 4,046,179 brl.

3. Africa. H. D. Hedberg. 1954, **38**, 1460.—During 1953 there was an increase of a half-million brl over 1952 in the production of petroleum in Africa, the total being 18,031,047 brl.

Active petroleum exploration was carried on in nearly all countries, and marked increases were shown over the previous year in almost all lines of geological and geophysical exploration.

4. Middle East. W. E. Heater. 1954, **38**, 1504.—Record production was achieved in the Middle East countries with a total of 885,279,500 brl. 2 new fields were put on production in Kuwait, one in Iraq, and one in the Kuwait–Saudi Arabia Neutral Zone.

Geological exploration during 1953 was active in Turkey, Israel, India, Pakistan, and countries bordering the Persian Gulf.

5. Far East. G. F. Barnwell. 1954, **38**, 1526.—A record level of production was reached in 1953, with a total of 124,247,700 brl of crude oil. Indonesia was the greatest producer, with a total of 79,317,000 brl, an increase of 26% over 1952.

Geological exploration was carried out in W. Australia and to a lesser degree in Victoria. Oil was discovered in W. Australia from a well which produced at the rate of 23 brl/hr through a ¼-in bottom-hole choke; it was found in a sandstone believed to be Birdrong formation of Lower Cretaceous age.

E. N. T.

30. Estimating oil reserves. J. J. Arps. *J. Petrol. Tech.*, 1954, **6** (7), 55–7.—Oil reserve estimates are often most urgently needed at a time when only a minimum of information is available. The usual history of reserve estimates over the life of a field shows 3 phases: brl/acre, by comparison with the performance of similar fields in the same area; brl/acre-ft, when estimates can be made on a volumetric basis; the decline curve phase. The uncertainty diminishes as time goes on.

It is common experience that really good fields are generally under-estimated in the early stages, while poorer ones are usually over-estimated.

The decline curve phase can use any variable which can be measured with reasonable accuracy, and which has a known end point and can be plotted against time or cumulative production.

G. D. H.

31. Gas processing on oilfields. C. A. Bouman. *Ingenieur, 's Grav.*, 20.8.54, **66** (34), M25–35.—The possibilities for the utilization of gas contained in wild crudes are mentioned, and various methods of gas purification and natural gasoline production are discussed and illustrated with flow sheets and actual examples. Gas is separated from the wild crude by depressurizing, and it is shown that the loss of natural gasoline is reduced with increasing number of depressurizing stages. Details are given of the gas treating plant on the Seria oilfield and the properties of absorption oils discussed. Adsorption on activated carbon is only of interest when the gas is available at medium or low pressure. When gas is produced under high pressure (> 2000 p.s.i.) use can be made of the joule–kelvin effect for low-temp dehydration and separation. 7 refs and 14 illustrations.

G. F. T. C.

32. Simplified analysis of unsteady radial gas flow. J. S. Aronofsky and R. Jenkins. *J. Petrol. Tech.*, July 1954, **6** (7), AIMME Tech. Paper No. 3802, 23–8.—A numerical method is presented for describing the transient flow of gases radially through a porous medium from which the producing rate is specified. Electronic punch card machines were used in making the calculations. The drainage radius is calculated as a function of time for various ratios of effective drainage radius to well radius, and reservoir radius to well radius, as well as for various ratios of effective drainage radius to reservoir radius. The computations have also yielded data on drainage radius *vs* time for various rates, and well pressure *vs* time for various rates.

G. D. H.

33. Twelve years of gas injection in a Frio sand. B. T. Millikin. *J. Petrol. Tech.*, 1954, **6** (6), 11–15.—The accumulation is a combined structural and stratigraphic trap on a large asymmetrical NE.-plunging nose. On the north and south the sand lens shales out. The western oil-producing flank dips at 1·5°. The sand averages 23% porosity, and the horizontal permeability ranges 100–500 mD, with the vertical permeability about half of this. The reservoir rock includes lenses of loosely consolidated sand, and contains clay, chiefly montmorillonite.

Oil was discovered in 1940, and the reservoir has had 43 producers, 34 being on production at the beginning of 1953. Throughout the field has been prorated. Gas injection was started in 1941, when less than 1% of the ultimate oil recovery had been obtained. The reservoir is *ca* 3750 ft deep, covers 1869 acres with oil, and has 401 acres of gas cap. The average thickness is *ca* 10 ft. The original reservoir pressure was 1590 p.s.i.g.; in 1950 the pressure was 1263 p.s.i.g. Original stock tank oil is placed at 21,742,000 brl, dissolved gas at 9936 m.m.c.f., and free gas at 4111 m.m.c.f. There is no substantial water drive.

At the beginning of 1953 cumulative oil production was 5,572,000 brl, gross gas production 14,087 m.m.c.f., and gas injection 10,323 m.m.c.f. Water production was 185,000 brl. 25 wells were flowing; 9 were on gas-lift. 10 had G.O.R.s of under 10,000, 9 had ratios of 10,000–20,000, and 5 exceeded 20,000.

In the first 3 years gas injection was 50% more than gas production. Injection is through one well. Injected gas seems to show no gasoline enrichment by passage through the reservoir. There has been little effect on the NE. part of the reservoir.

Material balance calculations suggest that recovery without gas injection would have been *ca* 20%; to date recovery is over 25%, and the producing rate is still 800 b.d. Gas injection seems to have cost 4 c/m.c.f.

Detailed production and other statistics are given.

G. D. H.

34. Plugging off water in fractured formations. G. C. Howard and P. P. Scott. *J. Petrol. Tech.*, 1954, **6** (6), AIMME Tech. Paper No. 3799, 21–6.—In an attempt to find materials for plugging off water in fractured formations, 17 materials were tested in the laboratory. Slurries of kerosine–cement, limestone–cement–water, and gilsonite–cement–water were tried in shallow test holes, and the first, which showed promise, was then used in 8 field tests. 6 wells responded to treatment, the daily oil output being increased by 550 brl, while the water production was reduced by 1367 b.d. Success seems to require the cement to be placed as low as possible in the well, so as not to impair oil zone permeability while reducing water coning. About 20 sacks of cement per foot of open hole seems satisfactory. If production tests after squeezing the cement show that oil production has been impaired, the oil section should be acidized.

The procedure is described, a summary of the field tests is given, and there is an outline of the mechanism involved.

G. D. H.

35. Determination of capillary properties of porous media. M. Killer. *Nafta* (*Yugoslavia*), 1954, **5** (6), 153–9.—Methods for the determination of the capillary pressure-liq saturation relationship for porous media are described, with emphasis on Purcell's mercury injection technique. Permeabilities derived from Purcell's equations from mercury capillary pressure curves are in satisfactory agreement with values determined experimentally. The lithology factor F was found to be 0·114 for cores of low permeability (0·048–39·0 mD).

(Author's abstract.)

36. Study of displacements in microscopic capillaries. C. C. Templeton. *J. Petrol. Tech.*, July 1954, **6** (7), AIMME Tech. Paper No. 3804, 37–43.—In order to provide quantitative information on the mechanism of multiphase flow through pores in a porous medium, a study has been made of gas–liq and liq–liq displacements in uniform Pyrex capillaries with dia of 4–35 μ. The observations on air–liq displacements with zero contact angle indicate the adequacy of a model based on Poiseuille's law, and the independence of capillary pressure and interfacial velocity.

For the displacement of a very viscous oil by water in a capillary initially filled with water the flow is faster than predicted by a model based on Poiseuille's law, probably due to the presence of a thin water film between the oil and the capillary wall.

The apparatus and techniques are briefly described, and the theory is outlined, assuming incompressible fluids, perfect displacement at the interface, no capillary hysteresis, and the applicability of Poiseuille's law. G. D. H.

37. Oil production from Upper Tertiary fresh-water deposits of West Pakistan. E. S. Pinfold. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1653.—The surface oil showings of W. Pakistan occur mainly in Eocene beds, more particularly in porcellanous limestones laid down during a transition from open-water marine to brackish-water inland sea conditions, and it is thought that the changing environment may have played some part in the origin of the oil.

In the outer foothills of the Himalayas, oil is produced from 4 open anticlinal folds. At Khaur, the first field to be found, most of the oil has been obtained from sandstones of the Nimadric system, the oil occurring in fissures at all depths from the surface beds overlying the Eocene at *ca* 5400 ft. At Dhulian field, where the folding is more open, small quantities of heavy oil occur irregularly in the Nimadric rocks a few hundred feet above the Eocene.

Almost the whole of the present oil production of W. Pakistan is from the Eocene limestones, and the total production from the fresh-water Nimadric rocks has been about 4 million brl. E. N. T.

38. Method for calculating the displacement of the partition boundary between oil and water within a stratum. I. A. Charnyi. *Izvest. Akad. Nauk SSSR., Otdel. Tekh. Nauk*, 1954 (4), 107–20.—Mathematical treatment of the problem, for 5 different cases. V. B.

39. Patents. U.S.P. 2,683,424 (5.3.53; 13.7.54). D. Kane. Counter-balanced deep well pumping apparatus.

U.S.P. 2,683,690 (26.9.52; 13.7.54). A. L. Armentrout. Composition for use in recovering lost circulation in wells comprising an aq mixture of equal parts of expanded perlite, diatomaceous earth, and coarse, ground, expandable, dehydrated bentonite clay.

U.S.P. 2,684,638–9 (29.1.51, 3.3.52; 27.7.54). W. J. Sutton, assr to Wilson Supply Co. Well pumps. J. M. S.

TRANSPORT AND STORAGE

40. Pipeline designing. N. Prica and S. Veletic. *Nafta* (*Yugoslavia*), 1954, **5** (6), 165–74.—Article deals with the drying of natural gas and refers to the theoretical fundamentals of chemistry and technology necessary for calculation purposes. Various processes using liq and solid drying media are described, with special reference to the glycol and aluminam process. An automatically controlled aluminam plant is described in detail. (Authors' abstract.)

41. Flow temperature in a gas pipeline. C. E. Schorre. *Oil Gas J.*, 27.9.54, **53** (21), 66.—An equation is presented which will accurately predict the temp of a gas at any point along a transmission line. The equation has been proved accurate on the lines of the Trans-Continental Gas Pipe Line Corpn, and will be of value to pipeline engineers in determining flow quantities under various conditions. Thus economic evaluation of desirability of installing cooling equipment can be made, and types of coating downstream of compressor stations specified. G. A. C.

42. New pipeline being built on turnkey contract basis. P. Reed. *Oil Gas J.*, 13.9.54, **53** (19), 112.—A 260-mile, 16-inch line for Saskatchewan crude is being built from Clearbrook, Minn., to Hastings, for Minnesota Pipeline Co. Problems involved included heating and pumping of viscous oil. Line will cross Mississippi at 2 points, necessitating extensive dredging at one point. G. A. C.

43. Northern Natural applies advanced pipe-laying methods. P. Reed. *Oil Gas J.*, 20.9.54, **53** (20), 202.—Practices developed by Northern Natural Gas Co in operations during the last 10 yr have been applied in the construction of a 960-mile pipeline. These include use of extra-heavy pipe for river crossings and extensive utilization of mill- and yard-coated pipe for dia of 12 inches and smaller. G. A. C.

44. Are ultrasonics practical for finding liquid accumulation in gas lines? R. G. Deering. *Oil Gas J.*, 20.9.54, **53** (20), 264.—The tests made by El Paso Natural Gas Co for presence of liq within gas pipelines using ultrasonic equipment and newly developed techniques appears sound. Unknown facts concerning 2-phase flow within pipelines are revealed by the method. G. A. C.

45. Renewed vigour for oil gas engines. C. S. Kenworthy. *Oil Gas J.*, 20.9.54, **53** (20), 167.—The result is described of installing an exhaust-driven turbocharger by Natural Gas

Pipeline Co to a 24-inch by 36-inch twin-tandem compressor. A 40% increase in power was obtained. G. A. C.

46. Welding and coating for swift progress. P. Reed. *Oil Gas J.*, 20.9.54, **53** (20), 188.—The welding construction and coating practices are described as adopted by Lakehead Pipe Line Co for effective progress in traversing the different types of terrain encountered in N. Minnesota, including a 23-mile stretch of swamp land. G. A. C.

47. Petroleum and natural gas lines in NW. Emsland. R. Tachilzik. *Erdöl u. Kohle*, 1954, **7**, 508–11.—Description, with map, of line network in area and of constructional details. High visc and pour (up to 26° C) of some crudes necessitated special measures, with oil temp up to 75° C at start of line, resulting in pressures of 95 atm. Total length of crude and gas lines approx 45 km each. V. B.

48. Gas-flow analyser. C. W. Martin. *Oil Gas J.*, 20.9.54, **53** (20), 152.—A new rapid procedure is given for making gas-flow calculations. Charts and examples are used to illustrate graphical solutions to all types of gas flow problems. 6 liq-flow charts can be used to obtain quick and accurate solutions to gathering-system hydraulic problems. 2 other charts give a gas-flow analyser and an oil-flow analyser. G. A. C.

49. Double shutdown safeguards storage. E. H. Parker. *Oil Gas J.*, 20.9.54, **53** (20), 171.—2 interconnected emergency systems are described, which reduce hazard to personnel and property. The systems comprise an electrically energized relay type and a pneumatic one energized by gas pressure. G. A. C.

50. Floating a tank on a hilltop. R. S. Kestner. *Oil Gas J.*, 20.9.54, **53** (20), 206.—The work is described of moving a 120 ft × 40 ft, 80,000-brl cone-roof tank along the crest of a rocky ridge by flotation. The method proved safe, dependable, and economic, and was completed in 12 days. G. A. C.

51. New draft DIN standard for identification of lubricant containers, lubricating equipment, and lubrication points. A. Böcker. *Erdöl u. Kohle*, 1954, **7**, 582–4.—Modification of previous draft (*cf.* Abs. **68**, 1953). Changes include No. of colours increased from 10 to 12, colours more rigidly specified, visc denoted by cs. New draft (DIN 51502) reproduced. V. B.

52. High-pressure air testing and cleaning. G. E. Foulkes. *Oil Gas J.*, 20.9.54, **53** (20), 182.—The Gulf Interstate Gas Co's method is described for cleaning and testing its new 850-mile, 30-inch main pipeline. Air is preferred for the work because it is cheaper, faster, safer, and surer. A test installation is described, and tables give equipment and man-power requirements, and data for air scrubbing a section. G. A. C.

53. Patent. U.S.P. 2,683,552 (18.2.52; 13.7.54). G. L. Brennan, assr to Warren Petroleum Corpn. Fire wall and tank installation for storage of inflammable liq. J. M. S.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

54. Development of refining industry and research (into petroleum conversion) during Stalin's 5 year plans. I. Niementowska. *Nafta* (*Krakow*), 1953, **9**, 282–5, 301–5.—A summary of development from 1926, when pre-war level of 9 million tons produced and 5·5 million tons refined was reached again. This figure was not adequate for the Soviet consumption of the day. In 1927 production rose just above 1904 level and several pipelines were built. By 1928 the proportion of gasoline produced rose at the expense of burning oil.

The first 5-year plan brought threefold increase in refining and doubled production figures. In the second 5-year plan (1932–37) production from new fields accounted for 83% of total production, the increase in total production being *ca* 10 million tons bringing it to just under 30 million tons total, whilst in the refining industry cracking has been increased *ca* 5 times. High octane spirit was produced alongside with petroleum coke, soaps, and asphalts. High S crudes were utilized and additives introduced. For 1938–42 increase of crude production by 60% and combined gas and crude, production by 77% were planned. 15 million-ton p.a. refineries and 4.6 million-ton p.a. cracking plants were intended. War caused this to be incomplete, and damage was not repaired until 1950. Pre-war production was reached in 1949. A greater importance was attached to diesel fuels and chemicals. For the 1951–55 period refining is to be doubled and cracking nearly trebled. In particular, gas and crude are to be treated near the fields, but transport and storage facilities must be increased.

The rest of the paper deals with scientific development over the last 25 years under the Government's sponsorship. M. S.

55. Upper Midwest to refine its own. Anon. *Petrol. Process.*, 1954, **9** (8), 1185–9.—The article is concerned with the development of a new district for small refineries of a few thousand up to 30,000 b.d. capacity which is situated in the Upper Midwest of the American Continent—the Dakotas, Minnesota, and Wisconsin. Most of the refineries will process Williston, Canadian crudes. J. W. H.

56. Crude pipe still for Sisak refinery. D. Riffer. *Nafta* (*Yugoslavia*), 1954, **5** (7), 181–7.—A description and basic data on a pipe still recently installed in the Sisak refinery and put into operation are given. The rated capacity is 150 tons/day of Iraq or domestic crude. In connexion with this plant and as a completion to the old crude dist, a gasoline and kerosine treating plant has also been erected and put into operation, the description of which is also given. The daily rated capacity of the treating plant amounts to 200 tons of sulphur-bearing gasoline and kerosine in simultaneous operation. (Author's Abstract.)

57. Planning for major unit turnarounds. A. Collins, C. H. Trotter, C. E. Newton, and J. J. Tippitt. *Oil Gas J.*, 13.9.54, **53** (19), 124.—This 4-part discussion outlines procedure for more economical and more efficient turnarounds by attention to: (1) co-ordination in planning; (2) routine maintenance during turnarounds; (3) use of standards for cost control; and (4) organization and scheduling procedures. G. A. C.

58. Improved method for designing tower anchorages. E. A. Picardi. *Petrol. Process.*, 1954, **9** (8), 1194–9.—The method given for the design of tower anchorages applicable to circular bases commonly employed on tall towers in the petroleum industry is particularly useful for conditions where wind loads produce tension on the windward anchor bolts. An example of how to apply the design method to a tower anchorage problem is given. J. W. H.

59. Products automatically blended in line. P. Reed and R. G. Deering. *Oil Gas J.*, 4.10.54, **53** (22), 132.—An automatic process is described for pipeline blending of components into finished gasoline, installed by Shell Oil Co at Wood River, Ill. The components are routed through automatic proportioning equipment directly into a line, and the process is controlled by panels carrying supervisory lights, memory and components totalizer, air controller, panel selector, and pump interlock switches, with an indicator by which the percentage for each component stream is adjusted. G. A. C.

60. Concrete piling halves foundation costs. F. C. Resen. *Oil Gas J.*, 4.10.54, **53** (22), 138.—Use is described of concrete piling rather than solid blocks, which more than halved foundation costs for pumps and small vessels in the Platformer–Udex unit at Great Southern Chemical Corpn's Corpus Christi, Texas, plants. Construction time is saved by pouring concrete into holes to form 2 or three reinforced pilings at each location, then a surface mat is poured to support the equipment.
G. A. C.

61. Newest phenol plant—it's 100% from petroleum. Anon. *Petrol. Process.*, 1954, **9** (8), 1223.—Details are presented of the 2nd new synthetic phenol plant to go on stream at Standard Oil Co's plant at Richmond, California. The plant is designed to produce phenol from 100% petroleum sources at a rate of 35 million lb/annum, via the cumene route.
J. W. H.

62. Silicones—new tools for petroleum operation. J. Oliver and M. Leavenworth. *Oil Gas J.*, 13.9.54, **53** (19), 118.—Silicone-based paint extends life of protective coatings by as much as 10-fold. Where organic heat-resistant paint lasted 2 months on gas engine mufflers and stacks, repainting with silicone-base products resulted in no deterioration after 15-month service.
G. A. C.

63. Redwood steam treaters save important money. R. W. Hill. *Oil Gas J.*, 27.9.54, **53** (21), 69.—Replacement of conventional steel treaters by Redwood steam treaters has resulted in virtual elimination of treater corrosion and scale removal at Stanolind Oil and Gas Co in W. Texas. During past 3 years, 13 Redwood treaters have been installed, and savings in scale-removing costs have varied from $50 to $115/month for each installation.
G. A. C.

64. Patents. U.S.P. 2,683,178 (28.7.50; 6.7.54). R. H. Findlay, assr to Phillips Petroleum Co. Apparatus for the purification of crystals of organic compounds.

U.S.P. 2,683,654 (25.1.52; 13.7.54). D. G. Bergman, assr to Universal Oil Products Co. Internally insulated and lined reactor.

U.S.P. 2,683,972 (30.10.51; 20.7.54). R. G. Atkinson, assr to Phillips Petroleum Co. Apparatus for reducing the moisture content of a high pressure gas stream using a condensation chamber fitted with a vortex tube for dividing the stream into a heated stream and a cooled stream.

U.S.P. 2,684,270 (19.6.51; 20.7.54). W. L. McClure, assr to Sun Oil Co. Apparatus for elevating granular solids by means of a lifting gas.

U.S.P. 2,684,290 (14.4.45; 20.7.54). C. Alexander and T. H. Whaley, assrs to Phillips Petroleum Co. Method and apparatus for pelleting a flocculent powder such as carbon black.

U.S.P. 2,684,838 (2.1.52; 27.7.54). E. E. Rush, assr to Phillips Petroleum Co. System for dispensing a fluid beneath the surface of a liq in which the fluid is soluble.

U.S.P. 2,684,867, –8, –70, –72, –73 (16.1.51, 24.12.48, 13.3.50; 27.7.54). C. H. O. Berg, assr to Union Oil Co of California. These patents all relate to method of conveying granular solids.
J. M. S.

DISTILLATION

65. Heat transfer from a spherical particle in an air stream. Anon. *Ingenieur, 's Grav.*, 3.9.54, **66** (36), 80–1.—Abstract of a paper by Y. S. Tang, J. M. Duncan, and H. E. Schweyer, "Heat and momentum transfer between a spherical particle and air streams." NACA Technical note 2867, Washington, 1953. The measurements were carried out on small steel spheres, heated by induction and suspended by extremely fine thermocouple wires in an airstream. 2 graphs. G. F. T. C.

66. The evaporation of droplets in an air stream. Anon. *Ingenieur, 's Grav.*, 3.9.54, **66** (36), 81.—Abstract of a paper by G. D. Kinzer and R. Gunn, "The evaporation, temperature, and thermal relaxation time of freely falling waterdrops," *J. Meteorology*, 1951, **8**, 71–84. The behaviour of droplets of 0·01–5 mm was investigated. Full agreement was obtained between the experimental and theoretical results. Of interest in spray drying studies and cooling tower operation.
G. F. T. C.

67. Aromatics—nitration grade. Anon. *Petrol. Process.*, 1954, **9** (8), 1224–6.—The largest extractive dist facility of its kind in the U.S.A. for the recovery of nitration-grade benzene and toluene from cat reformate has successfully passed performance tests at Shell Oil's Houston, Texas, refinery. In connexion with it is a 16,000-b.d. platforming unit.
J. W. H.

68. Patents. U.S.P. 2,684,326 (11.5.49; 20.7.54). D. M. Boyd, assr to Universal Oil Products Co. Control of a fractionation column to maintain a uniform temp and composition gradient in the column.

U.S.P. 2,684,837 (23.1.51; 27.7.54). H. C. North and M. S. Northup, assrs to Standard Oil Development Co. Apparatus for operating a vapour–liq-contacting zone.

U.S.P. 2,684,933 (31.7.50; 27.7.54). R. A. Findlay, assr to Phillips Petroleum Co. Recovery of gas oil from heavy residual oil using a gravitating bed of packing and steam dist.

U.S.P. 2,684,935 (24.6.52; 27.7.54). O. Redlich and G. M. Gable, assrs to Shell Development Co. Separation of mixture of isomeric aromatic hydrocarbons by dist in the presence of a perfluorocarboxylic acid having a b.p. within 25° C of the 50% b.p. of the mixture.

U.S.P. 2,684,936 (8.11.49; 27.7.54). G. L. Lupfer, assr to Standard Oil Co. Fractional dist column.
J. M. S.

ABSORPTION AND ADSORPTION

69. Patents. U.S.P. 2,684,124 (15.3.49; 20.7.54). J. E. Hines, assr to Union Oil Co of California. Gravity moving-bed adsorption process.

U.S.P. 2,684,729 (6.12.52; 27.7.54). C. H. O. Berg, assr to Union Oil Co of California. Adsorption process using a recirculating stream of granular solids.

U.S.P. 2,684,731 (21.9.49; 27.7.54). C. E. Starr and E. J. Newchurch, assrs to Standard Oil Development Co. In an adsorption process in which feed gases are contacted with active carbon, the desorbed carbon is reactivated by treatment with the tail gases at 900°–1100° F and then with steam at 1200°–1800° F.

U.S.P. 2,684,932 (17.2.50; 27.7.54). C. H. O. Berg, assr to Union Oil Co of California. Contacting adsorbent solids with fluids through zones of different pressures.
J. M. S.

Ger.P. 916,052, 24.6.54. — Wisfeld and — Müller, assrs to Metallges. AG, Frankfurt (M.). Use of activated C.

Ger.P. 916,408, 1.7.54. — Hofmeister and — Holthaus, assrs to F. J. Collin AG zur Verwertung von Brennstoffen und Metallen, Dortmund. Process for obtaining NH_3 from coal-dist gases.
BrennstChemie, 1954, **35** (13–14).
R. T.

SOLVENT EXTRACTION AND DEWAXING

70. Liquid–liquid extraction in theory and practice. H. R. C. Pratt. *Industr. Chem. Mfr*, 1954, **30**, 437–44. Liq–liq extraction first applied in industry to production of conc acetic acid from dil soln. Since applied to petroleum refining, animal and vegetable oils, phenol from gasworks liquors, biological and pharmaceutical products, separation of isomers and inorganic compounds. Equilibria classified according to number of components present, and to number of pairs of

these which are partly miscible; graphical representation on triangular and Janecke co-ordinates shown. Operations broadly classified into zero-, single-, and double-solvent types, and into batch and continuous processes, with and without reflux. 68 refs. A. C.

71. Patents. U.S.P. 2,683,762 (20.2.52; 13.7.54). D. A. McCaulay and A. P. Lien, assrs to Standard Oil Co. Mixtures of xylene isomers are separated by extraction with a mixture of liq HF and TiF_4.

U.S.P. 2,683,763–4 (30.9.52; 13.7.54). A. P. Lien and D. A. McCaulay, assrs to Standard Oil Co. Mixtures of dialkylbenzene isomers are separated by extraction with a mixture of liq HF and CbF_5 or TaF_5.

U.S.P. 2,684,324 (20.3.52; 20.7.54). E. W. Clarke, assr to Atlantic Refining Co. Solvent extraction with a mixture of nitrobenzene, aniline, and a minor proportion of carbon disulphide. J. M. S.

CRACKING

72. Conversion processes in the petroleum industry. E. S. Sellers. *Industr. Chem. Mfr*, 1954, **30**, 415–21.—Descriptions of petroleum processes as follows: (*a*) production of high O.N. gasoline from low O.N. feed stock, *e.g.* polymerization and hydrogenation of *iso*butene to *iso*-octane, alkylation of *iso*butane with propene, butene, or pentenes to give *iso*-octanes (both cat and non-cat processes), isomerization of *n*-butane and *n*-pentane into *iso*butane and *iso*pentane, to increase feedstock available for alkylation plants; (*b*) production of aromatic hydrocarbons, *e.g.* platforming, hydroforming, etc.; (*c*) desulphurization, *e.g.* cycloversion, unifining, autofining, trickle hydrodesulphurization for middle dist. Thermodynamic justification for reaction conditions quoted where applicable (*cf.* Abs. **1898**, 1954). A. C.

73. Fresh catalyst addition to cat crackers. W. E. McFatter and F. L. Resen. *Oil Gas J.*, 27.9.54, **53** (21), 86.—The methods are discussed by which 3 companies, Cities Service Refining Co, Eastern States Petroleum Co, and Gulf Oil Corpn, add cat, taking into account variables and economic factors. G. A. C.

74. Ultraforming—low-pressure cat reforming. J. H. Forrester, A. L. Conn, and J. B. Malloy. *Oil Gas J.*, 12.4.54, **52** (49), 139.—The low pressure process is described in which the cat used contains 0·6% platinum on an aluminium support, and a novel regeneration technique is employed. Cat life and test results are described, and tables show data on ultraforming of different naphthates. G. A. C.

75. Better refinery maintenance and turnaround. J. V. Early, J. Ward, H. Andrews, and R. A. Lawrenz. *Oil Gas J.*, 4.10.54, **53** (22), 142.—The National Co-operative Refinery Association's maintenance plan is described, as used at their McPherson, Kansas, plant which processes 26,000 b.d. on the various cracking units.

Proper planning and scheduling is essential, with close job follow-up and rigorous supervision, for efficient and economical maintenance. The work should be divided into proper divisions, such as emergency repair work, preventive maintenance, or long-range capital requirements.

The most efficient turnaround on the plant is obtained at 6-month intervals. G. A. C.

76. Patents. U.S.P. 2,683,109 (11.8.50; 6.7.54). D. E. Norris, assr to Houdry Process Corpn. Hydrocarbon conversion process, at least partially in the liq phase, using a granular contact material.

U.S.P. 2,683,683 (6.4.51; 13.7.54). G. A. Mills, assr to Houdry Process Corpn. Prior to the cat cracking of petroleum fractions containing heavy metal components deleterious in such cracking, the fractions are contacted with hydrogen sulphide or ammoniacal hydrogen sulphide to form heavy metal sulphides and the sulphides removed.

U.S.P. 2,683,685 (28.7.51; 13.7.54). G. L. Matheson, assr to Standard Oil Development Co. Elutriation of finely divided cat in a fluidized cat hydrocarbon conversion process.

U.S.P. 2,684,325 (26.12.51; 20.7.54). R. M. Deanesly, assr to Universal Oil Products Co. A paraffinic fraction in the gasoline boiling range is separated into a lower (A) and a higher (B) boiling fraction. A is thermally cracked and a light fraction (C) containing gaseous and liq olefins separated from the products. B is cat reformed and an intermediate fraction (D) is separated from the products. C and D are mixed and subjected to a polymerization–alkylation reaction and the products are mixed with the products from the cracking and reforming stages boiling up to *ca* 400° F to form an improved gasoline.

U.S.P. 2,684,340 (29.4.49; 20.7.54). L. L. Baral and C. P. Wilson, assrs to Davison Chemical Corpn. Silica–alumina cat is made by precipitating a silica gel from an alkaline silicate, impregnating the gel with aluminium sulphate in sufficient quantity to yield a gel containing 20–24% alumina, neutralizing and drying the gel, and then washing it. One wash is with weakly acidic water and another with a weak aq soln of ammonia.

U.S.P. 2,684,390 (8.5.50; 20.7.54). J. L. Bills, assr to Union Oil Co of California. High temp conversion and quenching process.

U.S.P. 2,684,768 (26.2.52; 27.7.54). E. V. Bergstrom, assr to Socony-Vacuum Oil Co. Apparatus for handling fluidized contact material during its regeneration.

U.S.P. 2,684,927 (10.2.49; 27.7.54). E. V. Bergstrom, assr to Socony-Vacuum Oil Co. Downflow cat cracking process.

U.S.P. 2,684,928 (18.4.49; 27.7.54). C. H. O. Berg, assr to Union Oil Co of California. Conveyance of granular cat in a cat cracking process.

U.S.P. 2,684,929 (29.7.49; 27.7.54). A. H. Shutte, assr to Union Oil Co of California. Method of handling solid contact material in the conversion of hydrocarbons.

U.S.P. 2,684,930–1 (20.8.49; 27.7.54). C. H. O. Berg, assr to Union Oil Co of California. Fluidized cat cracking processes. J. M. S.

Ger.P. 914,970, 3.6.54. — Herbert and — Gross, assrs to Metallges. AG, Frankfurt (M.). Process for reducing iron cat.

BrennstChemie, 1954, **35** (13–14). R. T.

HYDROGENATION

77. Patents. Ger.P. 914,969, 3.6.54. — Kölbel and — Engelhardt, assrs to Rheinpreussen AG für Bergbau und Chemie, Homburg (Ndrh.). Process for CO hydrogenation on Co cat.

Ger.P. 914,972, 3.6.54. — von Füner, — Oettinger, and — Göhre, assrs to BASF AG, Ludwigshafen (Rhein). Process for pressure hydrogenation, dehydrogenation, reforming, or cracking of hydrocarbons. (Addn to Pat. 869,200.)

Ger.P. 915,330, 10.6.54. — Pier, — Free, and — von Füner, assrs to BASF AG, Ludwigshafen (Rhein). Method for refining-hydrogenation of hydrocarbons. (Addn to Pat. 886,897.)

BrennstChemie, 1954, **35** (13–14). R. T.

POLYMERIZATION

78. Patents. U.S.P. 2,683,138 (20.8.49; 6.7.54). H. G. Goering and J. P. Rocca, assrs to Standard Oil Development Co. 50–75 wt % styrene, 25–35 wt % *iso*butylene, and 10–18 wt % propylene are copolymerized at −44° to 0° C in the presence of boron fluoride or aluminium chloride.

U.S.P. 2,683,139 (9.10.51; 6.7.54). R. F. Leary and L. M. Welch, assrs to Standard Oil Development Co. A diolefin–mono-olefin mixture is polymerized in the presence of aluminium chloride (I), a paraffinic hydrocarbon solvent and methyl alcohol is added to the reaction mixture to precipitate I as a complex, the precipitate is removed, and a light-coloured resin recovered from the solvent.

U.S.P. 2,683,141 (6.2.52; 6.7.54). M. Erchak, assr to Allied Chemical and Dye Corpn. Continuous production of wax from ethylene.

U.S.P. 2,683,162 (23.7.49; 6.7.54). A. H. Gleason, assr to Standard Oil Development Co. Drying oils are made by copolymerizing butadiene-1,3 and styrene in the presence of sodium, mixing the product with an acrylic nitrile, alkyl acrylate, vinyl acetate, vinyl ketone, cinnamaldehyde, thioglycolic acid, alkyl thioglycolate, or thiosalicylic acid, and heating to 50°–250° C. J. M. S.

ALKYLATION

79. Patents. U.S.P. 2,683,754 (11.6.51; 13.7.54). R. M. Kennedy and A. Schneider, assrs to Sun Oil Co. An olefin is alkylated with an alkyl fluoride having at least 2 carbon atoms in the presence of BF3 and a *cyclo*pentane having at least one alkyl substituent and at least one *tert*-hydrogen atom attached to the nucleus.

U.S.P. 2,683,755 (11.6.51; 13.7.54). R. M. Kennedy and A. Schneider, assrs to Sun Oil Co. Alkyl substituted *cyclo*alkanes are made by reacting in the liq phase, a *cyclo*alkyl fluoride and an olefin in the presence of BF_3, and a *cyclo*pentane of the type mentioned in U.S.P. 2,683,754 or an *iso*paraffin having at least one *tert*-hydrogen atom.

U.S.P. 2,683,756 (11.6.51; 13.7.54). R. M. Kennedy and A. Schneider assrs to Sun Oil Co. *cyclo*Pentanes having 1–3 alkyl substituents and at least one *tert*-hydrogen atom attached to the nucleus are reacted with *cyclo*-olefins having not more than 3 alkyl substituents in the liq phase in the presence of BF_3 and *cyclo*pentyl or *cyclo*hexyl fluoride.

U.S.P. 2,683,757 (11.6.51; 13.7.54). R. M. Kennedy and A. Schneider, assrs to Sun Oil Co. *cyclo*Pentanes are separated from *cyclo*hexanes by bringing the mixture, in the liq phase, into contact with BF_3 and an organic fluoride. The *cyclo*pentanes are preferentially reacted to form higher boiling hydrocarbons which can be separated from the *cyclo*hexanes.

U.S.P. 2,684,389 (3.11.50; 20.7.54). W. C. Offutt, assr to Gulf Research and Development Co. Phenol and monoalkylphenols are alkylated with olefins in the presence of a silica–alumina adsorbent cat at 250°–350° F and a pressure of 250–350 p.s.i. J. M. S.

Ger.P. 916,167, 24.6.54. — Ziegler and — Zosel, assrs to Ziegler, Mülheim. Method for producing Al trialkylenes.
BrennstChemie, 1954, **35** (13–14). R. T.

ISOMERIZATION

80. Patents. U.S.P. 2,683,758–61 (30.4.52, 30.1.52, 22.3.52, 30.4.52; 13.7.54). D. A. McCaulay and A. P. Lien, assrs to Standard Oil Co. These patents relate the use of a TiF_4–HF cat in the isomerization of *o*- or *p*-xylene to *m*-xylene, in the disproportionation of ethylbenzene to *m*-diethylbenzene, in the production of 1,3,5-ethylxylene from xylene and ethylbenzene, and in the disproportionation of xylene to trimethylbenzene. J. M. S.

CHEMICAL AND PHYSICAL REFINING

81. Patents. U.S.P. 2,683,108 (2.1.52; 6.7.54). W. K. T. Gleim, assr to Universal Oil Products Co. Phenols and thiophenols are removed from petroleum fractions by contacting with an aq soln of an alkaline earth metal carbohydrate complex. The carbohydrate is a mono- or di-saccharide ketose or aldose containing 5 or 6 carbon atoms per saccharide unit.

U.S.P. 2,683,288 (10.3.51; 13.7.54). F. J. Fontana, assr to Richfield Oil Corpn. Hot molten petroleum pitch is solidified by pouring it on to the surface of a body of cooling water and mechanically pulling the pitch beneath the surface.

U.S.P. 2,683,752 (21.11.52; 13.7.54). W. E. Stanley and R. A. Dinerstein, assrs to Standard Oil Co. Phenols are removed from their aq soln by adjusting the pH to <9 and extracting the phenols with a dist residue from the OXO process.

U.S.P. 2,684,926 (23.7.49; 27.7.54). A. J. Brandel, assr to California Research Corpn. In the lead sulphide sweetening process, sodium sulphonates, prepared by sulphonating a sulphur dioxide extract of kerosine and neutralizing with caustic soda, are added to inhibit emulsion formation. J. M. S.

Ger.P. 914,849, 3.6.54. — Stoller, assr to F. J. Collin AG, Dortmund. Process for desulphurizing aq-NH_3 with high H_2S cont.

Ger.P. 916,202, 24.6.54. —Bayerlein and — Strauss, assrs to F. J. Collin AG, Dortmund. Process and plant for extracting S from S-containing masses, *e.g.* gas purifiers.

Ger.P. 916,617, 1.7.54. — Blomén, assr to A.B. Linderoths Patenter, Stockholm. Device for separating solids from a gas stream.

Ger.P. 916,618, 1.7.54. — Schlewitz, Bad Hersfeld. Dust separator. (Addn to Pat. 884,900.)
BrennstChemie, 1954, **35** (13–14). R. T.

SPECIAL PROCESSES

82. Separation of *iso*butylene. G. P. Baumann and M. R. Smith. *Oil Gas J.*, 27.9.54, **53** (21), 71.—The manufacture of *iso*butylene is described by the combination sulphuric extraction–regeneration method developed by the Standard Oil Development Co. Tables give typical feed and product stream analyses, and economic data on butylene manufacture. G. A. C.

83. Patents. Ger.P. 914,850, 3.6.54. — Kölbel and — Ackermann, assrs to Rheinpreussen AG für Bergbau und Chemie, Homberg (Ndrh.). Process for obtaining hydrocarbons from CO and H_2. (Addn to Pat. 763,307.)

Ger.P. 914,971, 3.6.54. — Kölbel and — Ackermann, assrs to Rheinpreussen AG für Bergbau und Chemie, Homberg (Ndrh.). Process for conversion of CO with H_2.

Ger.P. 882,888, 3.6.54. — Löpmann and — Schwenke, assrs to Chem. Werke Bergkamen AG, Bergkamen. Method for producing hydrocarbons from CO-containing gases with high H_2 excess.

Ger.P. 915,806, 16.6.54. — Kölbel, assr to Koppers G.m.b.H., Essen. Method for producing hydrocarbon mixtures from gases containing CO and H_2.

Ger.P. 916,050, 24.6.54. — Goymann, assr to Madruck-Ges. für maschinelle Druckentwasserung m.b.H., Miesbach. Plant for dehydrating wet and sludgy masses, *e.g.* peat.
BrennstChemie, 1954, **35** (13–14). R. T.

METERING AND CONTROL

84. Error curves of liquid meters. H. Bluschke. *Erdöl u. Kohle*, 1954, **7**, 504–6.—Theoretical discussion of determination of error curves, with reference to influence thereon of fluid properties, meter constants, temp. V. B.

PRODUCTS

CHEMISTRY AND PHYSICS

85. Reaction mechanism of the Fischer-Tropsch synthesis. VII. Synthesis of hydrocarbons. H. Kölbel and E. Ruschenburg. *BrennstChemie*, 1954, **35** (11–12), 161–7.—Theories of chain growth in the Fischer–Tropsch reaction are reviewed. Chain growth is verified by examination of the synthesis products obtained under identical conditions with and without gaseous olefin addn to the synthesis gas. The reaction is consummated only in simultaneous presence of CO and H_2. Chain growth must be coupled with CO hydrogenation. Operating conditions affecting chain growth are olefin concn in synthesis gas and operating pressure, synthesis temp, type of process—fixed, whirling, liq cat—cat composition, especially in relation to hydrogenating capacity. Increases in oil yield are shown on addn of C_2H_4, C_3H_6, and C_4H_8. Addn of residual gas from stage 1 to stage 2 synthesis without removing gaseous hydrocarbons produces a 7·4% greater oil yield. Storch's scheme for the reaction mechanism of chain growth and rupture is presented stepwise and discussed in relation to other theories. Numerous charts and 23 literature refs.

R. T.

86. Activity of various alkali metals in the *iso*butylol contact. F. Runge and K. Zepf. *BrennstChemie*, 1954, **35** (11–12), 167–70.—Addn of alkali carbonates to conventional ZnO-CrO_3 cat in the *iso*butyl synthesis increases yields of *iso*butyl fractions as tabulated. The order of efficiency is Li, K, Na, Rb, Cs. X-ray exposures indicate the chromite structure as decisive for cat activity. Small changes in cat composition and production, apparatus as illustrated, and working pressure exert great influence on reproducibility of results. R. T.

87. Kinetics and decomposition mechanism of gaseous acetic and propionic aldehydes. M. Niclause. *Rev. Inst. franç. Pétrole*, 1954, **9**, 327–66, 419–48.—General relations established between mechanism and initial rate of chain decomp of org substance in gas phase. From such theoretical considerations, and with reference to known experimental facts, including those now determined, various types of chain decomp of gaseous acetaldehyde and propionaldehyde are compared (photolysis, induced pyrolysis, normal pyrolysis). Such comparison shows marked similarity between decomp reactions of the 2 aldehydes; concluded that at initial moment all these reactions are derived from essentially the same type of mechanism, which is described; only the initiation and " transfer " processes are dependent on the type of homogeneous decomp considered. Under certain conditions secondary processes can occur. Possible influence of the end products on mechanism and rate of chain decomp, at a given instant of the reaction, are considered, attempt is made to explain the auto-retarded nature of the normal pyrolysis of gaseous acetaldehyde. 109 refs. (Author's summary.)

88. Catalysis of olefin oxidation by heavy metal ions in non-polar media. G. L. Banks, A. J. Chalk, J. E. Dawson, and J. F. Smith. *Nature, Lond.*, 1954, **174**, 274.—Details are given of the autoxidn of *cyclo*hexane at 60° C catalysed by the *n*-heptanoates of Co, Mn, Cu, or Fe; (*a*) in a non-polar medium; (*b*) in a polar medium containing 10% wt heptanoic acid. The marked differences between reactions of group (*a*) and group (*b*) indicate that the reaction mechanisms are different in the 2 groups.

With Mn in non-polar medium there is a marked induction period which is eliminated by a little *tert*-butyl hydroperoxide. A mechanism for the iron-catalysed reaction in non-polar medium is suggested. H. C. E.

89. Rate of spread of liquid pools over horizontal solid surfaces and between approaching parallel flat plates. E. B. Bielak and E. W. J. Mardles. *J. Coll. Sci.*, 1954, **9**, 233–42.—Observations were made of the spread of light hydrocarbon oil, liq paraffin oil, silicone fluid, and several pure organic compounds (mainly alcohols) on glass, Al, Al alloy, brass, and steel. The rate of radial flow has been related to film thicknesses and to the forces acting on the liq.

For horizontal surfaces it is found that $r = (ct/\eta)^{0.3}$, where r is the radius of the pool of liq of visc η, t is the time, and c is a constant. For approaching (loaded) surfaces it is found that initially $r = (cft)^{\frac{1}{3}}$, where f is the force acting and the constant c contains the term $1/\eta$, but after periods of *ca* 100 sec the rate of increase of radius often falls off.

The spreading behaviour of a mixture of liq often differs from that of the constituents; for example, a plot of the composition of a binary mixture vs area of the pool after a given time sometimes shows a maximum.

The results are discussed with reference to the specificness of the spread of liq and the effect of surface finish. H. C. E.

90. Viscosity and electroviscous effect of emulsions. M. van der Waarden. *J. Coll. Sci.*, 1954, **9**, 215–22.—Measurements of visc and light-scattering were made on emulsions of water and medicinal white oil containing 5–35% wt sodium naphthasulphonates (av mol. wt. 475). Visc of emulsions containing 5–30% wt oil were interpreted by Einstein's equation to show an apparent increase in oil concn during flow. Light-scattering measurements on emulsions containing 0·1–0·0005% wt oil were used to obtain the particle size of the oil droplets. These data were used to calculate the apparent increase in particle dia during flow in cases where interaction between oil droplets is precluded. This increase seems to be independent of particle size, and is ascribed to the electric charge on the surface of the particles. H. C. E.

91. Symposium on combustion. I. Outlines of combustion research. J. J. Broeze. *Ingenieur, 's Grav.*, 27.8.54, **66** (35), O51–5.—After making some general remarks on the historical development of combustion research, the author states that the main purpose of this symposium is to stimulate engineers and industrialists to strike out on new paths in order to achieve new standards of performance in their own spheres of action. He also draws attention to symposia on combustion held in the U.S.A. Some interesting points raised during the " Fourth Symposium on Combustion " held at the M.I.T. in Sept. 1952, are briefly discussed. (Author's abstract.)

G. F. T. C.

92. Symposium on combustion. II. Chemical reactions in flow systems. S. S. Penner. *Ingenieur, 's Grav.*, 27.8.54, **66** (35), O55–6.—The paper is an abstract of the author's lecture. A summary is presented of the principles of chemical kinetics in a form suitable for applications involving chemical reactions in flow systems. 10 refs are included dealing with the analytical treatment of representative problems.

G. F. T. C.

93. Symposium on combustion. III. Ignition delay measurements on gas turbine fuels by the N.G.T.E. method. B. P. Mullins. *Ingenieur, 's Grav.*, 3.9.54, **66** (36), O57–61.—After briefly discussing the different requirements for spark ignition, diesel, and turbine fuels with regard to their spontaneous ignition characteristics the author describes the standard spontaneous ignition rig used by the National Gas Turbine Establishment for measuring the ignition delay in the range of 0·5–30 millisec as a function of temp. A T-8cheme Mark IV combustion chamber was used to provide a gas stream of controllable temp and velocity. The fuel under test was injected via an atomizer into this stream, the distance of the flame front from the atomizer nozzle giving a measure of the ignition delay under known conditions of stream temp and velocity. Linear relationships are obtained when the log of the ignition delay is plotted against the reciprocal of the absolute ignition temp. Frequently the curves for 2 different fuels intersect at a given point, and it is remarkable that at a

temp of approx 825° C the order of relative ignitability of *n*-heptane and *iso*-octane becomes reversed. 10 figs and 16 refs. G. F. T. C.

94. Symposium on combustion. IV. Flames, their combustion and radiation. J. E. de Graaf. *Ingenieur, 's Grav.*, 3.9.54, **66** (36), O61g.—The paper constitutes a short report on the activity of the International Flame Radiation Research Joint Committee.

The main items under investigation in the Ijmuiden research station are the mechanism of soot formation and the aerodynamics of the flame. Electron micrographs have shown that soot particles sampled at various points in the flame range in size from 0·006 to 0·06 μ, with a few particles as large as 15 μ. Experiments carried out on the radiation from a preheated non-burning stream of propane lead to the conclusion that it is doubtful whether the soot formation is entirely due to pyrolysis in the vapour phase.

The importance of a strongly radiating flame in industrial furnaces is emphasized, together with the contradiction between its main requirements, *i.e.* the delayed combustion to allow the formation of soot and rapid combustion in order to obtain high temp. Apart from differences in detail, a flame is aerodynamically very similar to a free jet. This is illustrated by means of velocity distribution curves. Graphs are presented showing the concn of CO_2, CO, H_2O, N_2, O_2, H_2O, and temp at various places throughout the flame body. The influence of various amounts of carburettor oil (pitch creosote) on the emissivity and radiation of a fuel oil flame was also investigated. 9 figs, 8 refs. G. F. T. C.

95. Patent. Ger.P. 916,053, 24.6.54. — Kloepfer, assr to Deutsche Gold- und Silber-Scheideanstalt formerly Roessler, Frankfurt (M.). Process for solidifying low-drop pt substances, *e.g.* paraffins, waxes, fats, resins, etc.
BrennstChemie, 1954, **35** (13–14). R. T.

ANALYSIS AND TESTING

96. Colour determination on oils. H. D. Schulz-Methke. *Erdöl u. Kohle*, 1954, **7**, 501–3.—Basic principles discussed, with particular reference to appropriate German standard methods. Expression of colours in terms of iodine scale explained, and operation of 2 photo-electric colorimeters described. V. B.

97. Recycle extraction after K. H. Lüers in mineral oil analysis. E. H. Kadmer. *BrennstChemie*, 1954, **35** (11–12), 170–5.—In the Lüers completely closed recycle apparatus described and illustrated, fresh solvent is brought into continuous contact with the oil by fall or pump pressure. The solvent must be lighter than the oil at the operating temp and passes upwards; the extract flows away through a trickle valve. Solvents must be water-sol and occasionally H_2O-containing monovalent alcohols, aldehydes, ketones, and ethers, *e.g.* methanol, ethanol, acetone, and diethylether. Ethanol has a better solvent power for mineral oils than methanol, propanol has a more intensive solvent effect than ethanol. Selectivity of methanol is most marked, decreasing over ethanol, propanol, and butanol; the higher fatty alcohols are without selectivity. Analyses for the recycle extraction of various oils are given applied to the triangular co-ordinate system of Nelson *et al*, from which the character of the oils is observed. A modified procedure is foreseen for fatty oils, fatty acids, waxes, and resins. R. T.

98. Assessment of effectiveness of " premium " additives on the basis of laboratory tests with hot motor oils. A. Bukowiecki. *Schweiz. Arch. angew. Wiss.*, 1954, **20**, 255–63.—36-hr (9 hr on 4 successive days) corrosion tests using 50 × 25 × 1-mm plates (changed 3-hourly) of Pb, Cu, Fe, suspended in 400 ml oil in 12-cm-high, 8·5-cm-dia glass beaker. Temp 140° ± 3° C, stirrer 1100 r.p.m. Beakers uncovered, but glass cover can be fitted. Total wt loss of plates plotted against time. Study made with commercial Regular, Premium, and HD oils (SAE 30). Regular oils strongly attack Pb, slight attack on Cu, almost nil on Fe. Premium and HD oils show successive decrease of attack on Pb, but some increase on Cu with HD oil. Effect of covering beaker is to decrease corrosion for regular oils but to increase it greatly for Premium and HD; concluded that covered beaker test is too severe and that beaker should remain open. Effect of extending test duration to 72 hr examined: wt loss excessive, and 36 hr is better correlation with practice. For Regular oils wt loss of Pb decreases with increasing oil visc (SAE 10, 30, 50), but for inhibited oils effect of visc increase is slight. Visc effect confirmed by lab blends (neutral oil + bt stock + 4% Paranox 62). Test reproducibility is fair, quite adequate to distinguish, by wt loss of Pb, inhibited from non-inhibited oils. Corrosion effect is not electrochemical, since no difference noted in tests made with conducting or insulating support for plates (*cf* Abs. **1017**, 1953). V. B.

99. The analysis of oilfield waters. M. Killer. *Nafta* (*Yugoslavia*), 1954, **5** (7), 187–90.—Short-cut methods for the chemical analysis of oilfield waters as a basis for their classification according to Palmer are discussed. A rapid turbidimetric titration procedure of the determination of sulphates is described, using a simple comparator of the Hellige type. The method is sufficiently accurate for classification purposes and allows the carrying-out of 2 determinations in only 20–30 minutes. Colorimetric procedures for the determination of nitrates, iron, and silicates are also given.
(Author's abstract.)

100. New test for scourability of spinning oil. Anon. *Amer. Dyest. Rep.*, 1954, **43** (9), 263–9.—The need for an improved test is outlined; 2 methods are described for uniform application of oils to yarn in the laboratory. The subsequent scouring is by a continuous rather than a batch process. The limitations of other laboratory methods for assessing oil scourability are discussed, and it is concluded that the present method is satisfactory and shows up small differences in oil scourability by revealing the combined effects of oil build-up and detergent exhaustion as the scouring proceeds.
C. N. T.

101. Furfural solvent extraction. F. Sef and M. Maretic. *Nafta* (*Yugoslavia*), 1954, **5** (5), 125–30.—Dewaxed oil fractions of Iraq crude were investigated for their suitability for the manufacture of lub oils by furfural solvent extraction. Investigations were carried out in a laboratory extraction column of 1100 mm height, filled with 4 mm Raschig rings, the efficiency of which was previously tested in the course of batch multistage countercurrent extraction runs. With the aid of this column, data were obtained as to the influence of process variables on the yields and properties of the refined product. The following process variables were examined: extraction temp from 73° to 112° C; the furfural–oil ratio from 114 to 522; and the temp gradient from 0° to 37° C. By comparing results of the batch multistage countercurrent extraction with those obtained on the column under the same conditions (temp and furfural–oil ratio), it was found that the extraction of the whole column approx corresponded to a 5-stage extraction, while the extraction with a shortened column (650 mm filling) corresponded with a 3-stage batch countercurrent extraction. Runs which were carried out for investigating the influence of the temp and furfural–oil ratio showed that, under the conditions applied, the quality of the raffinate (controlled by V.I.) changes linearly va yields, without respect to whether these changes were attained by varying the temp of extraction or the furfural–oil ratio. Runs for determining the temp gradient maintained over the length of the tower, at approx optimum conditions, gave satisfactory results. From dewaxed dist of Iraq crude of 54·5 and 41·2 V.I., raffinates were obtained in 60% yield with 96·2 and 90·7 V.I.
(Authors' abstract.)

GAS

102. Dehydration of wet gas with natural hydrargillite. D. Gjurdevic. *Nafta (Yugoslavia)*, 1954, **5** (4), 103–8.—The author briefly considers the conditions under which gas hydrates will form and presents experimental data, showing the effect of adsorption of naturally occurring adsorbents possessing satisfactory surface activities. Since the effect of adsorption is strongly influenced by the rate of flow of the gas, the choice of the correct contact time is of great importance. The dehydration under elevated pressures and industrially applicable space velocities is 100%, until the saturation of the adsorbent reaches 16–17% by wt. The properties of the activated alumina used in this investigation are described and the conditions of adsorption and reactivation processes are given. (Author's abstract.)

103. Patents. Ger.P. 914,605, 26.5.54. — Kalb, assr to Wacker-Chemie G.m.b.H., München. Gas drying process.

Ger.P. 916,447, 1.7.54. — Hahn, assr to Koppers G.m.b.H., Essen. Method for producing pure CO.
BrennstChemie, 1954, **35** (13–14). R. T.

ENGINE FUELS

104. The purification of heavy fuel oil for diesel engines. H. T. Winberg. *Mot. Ship*, July 1954, **35** (412), 150.—An analysis is made of the present situation regarding the use of heavy fuel for diesel engines, and an attempt made to establish the tendencies in development in both oil and engine fields and the use of separators. The subject is examined from 4 aspects; (*a*) difference in price between diesel and heavy oils and latter's suitability as diesel fuel; (*b*) difference in cost of engines run on the 2 types of fuel and their suitability for heavy oil; (*c*) cost of separator plant and other equipment for purification of heavy oil and separator plant's ability to purify the oil; and (*d*) degree of utilization of heavy oil. A summary of available information is included in the form of 44 literature refs. U. M.

105. An integrated plant for tetra ethyl lead. Anon. *Industr. Chem. Mfr*, 1954, **30**, 429–36.—Detailed description with photographs of Associated Ethyl Co's Ellesmere Port plant for T.E.L. production. A. C.

106. Patents. Ger.P. 914,534, 26.5.54. — Hagemann, assr to Ruhrchemie AG, Oberhausen (Rhld.). Method for producing especially knockproof petrol.

Ger.P. 915,016, 3.6.54. Verkaufsvereinigung für Teererzeugnisse AG, Bochum. Method for producing fuel oil.
BrennstChemie, 1954, **35** (13–14). R. T.

LUBRICANTS

107. Synthetic lubricants obtained by polymerization of unsaturated diesters. F. Reynaud. *Chim. et Industr.*, 1954, **72**, 415–21.—Neutral esters of fumaric and maleic acids obtained by esterification in C_6H_6 in presence of H_2SO_4, esters can be polymerized by boiling under reflux, higher esters requiring cat (benzoyl peroxide). Study made of fumaric ester polymers (mainly trimers). Polymerized esters of alcohols (C_4–C_8, excluding *iso*C_4) have high (86–129) V.I., suitable visc (15–26 cs/100° C), low (−28° to −48° C) pour, are non-corrosive, have good stability, and should be suitable lub; they can be blended with mineral oils. V. B.

108. Hydrodynamic lubrication of roller bearings. A. A. Milne and J. A. Cole. *Engineer, Lond.*, 1954, **198**, 330.—Objections raised as to validity of analysis given in W. Lewicki's article under same title (*cf.* Abs. **1824**, 1954). A. C.

109. Operational handling and storage of industrial lubricants. H. Schäfer. *Erdöl u. Kohle*, 1954, **7**, 529–32.—Discussion of desirable works practice; compounded oils should not be stored in galvanized containers, due to risk of contamination with Zn soaps. Oil deterioration mechanism exemplified by discussion of lubrication of steam turbines and reciprocating engines. V. B.

BITUMEN, ASPHALT, AND TAR

110. Patents. Ger.P. 914,675, 26.5.54. — Schlumberger and — Holtmann, assrs to Gelsenkirchener Bergwerks-AG, Essen. Method for producing synthetics from too-fluxing coal tar pitches.

Ger.P. 915,132, 3.6.54. — Croy, assr to Chem. Fabr. Badenia, Keilmann OHG, Mannheim. Method for producing pitches with high gel-resin (C_3-resins) cont.

Ger.P. 915,609, 16.6.54. — Vogel, assr to Vogel, Leutkirch (Allgäu), and Hockel, Leutkirch (Allgäu). Production of bitumen emulsions.

Ger.P. 915,847, 16.6.54. — Daimler, assr to Farbwerke Hoechst AG, formerly Meister Lucius & Brüning, Frankfurt (M.). Method for producing bituminous dispersions.
BrennstChemie, 1954, **35** (13–14). R. T.

SPECIAL HYDROCARBON PRODUCTS

111. Wax remover specification. Anon. *Soap, N.Y.*, Oct. 1953, **19** (10), 161.—The provisions of the proposed interim Federal Specification P-R-00201 (GSA-FSS) are quoted. M. V. J.

112. Patents. Ger.P. 914,493, 26.5.54. — Büchner and — Roelen, assrs to Ruhrchemie AG, Oberhausen (Rhld.)-Holten. Process for obtaining olefin-rich hydrocarbon mixtures.

Ger.P. 915,085, 3.6.54. — Stetter, — Bonn, and — Dierichs, Wuppertal. Method for producing long-chain carboxylic acids.

Ger.P. 914,885, 3.6.54. — Tramm, — Spiske, — Kolling, and — Rottig, assrs to Ruhrchemie AG, Oberhausen. Process for aromatizing or dehydrogenating hydrocarbons.

Ger.P. 916,107, 24.6.54. — Schmalenbach, assr to Koppers G.m.b.H., Essen. Process for obtaining naphthalene and benzene with simultaneous H_2O separation from illuminating gas.

Ger.P. 916,409, 1.7.54. — Gruschke, assr to Farbwerke Hoechst AG, formerly Meister Lucius & Brüning, Frankfurt (M.). Method for producing sulphonic acids. (Addn to Pat. 907,174.)

Ger.P. 916,410, 1.7.54. — Graf, assr to Farbwerke Hoechst AG, formerly Meister Lucius & Brüning, Frankfurt (M.). Method for producing sulphonic acids. (Addn to Pat. 735,096.)

Ger.P. 916,411, 1.7.54. — Graf and — Gruschke, assrs to Farbwerke Hoechst AG, formerly Meister Lucius & Brüning, Frankfurt (M.). Method for producing sulphonic acids. (Addn to Pat. 907,174.)
BrennstChemie, 1954, **35** (13–14). R. T.

DERIVED CHEMICAL PRODUCTS

113. Preparation of propylene from *iso*propyl alcohol. J. J. Verstappen and H. I. Waterman. *Ingenieur, 's Grav.*, 3.9.54, **66** (36), 77–9.—A brief description is given of a semi-technical apparatus for continuous cat dehydration of I.P.A. over activated alumina. At 300°–350° C the production of 98–100% pure propene is almost stoichiometric. The experimental results obtained with 2 cat are discussed. 1 table and 2 illustrations. G. F. T. C.

114. Patents. Ger.P. 915,212, 10.6.54. — Rottig, assr to Ruhrchemie AG, Oberhausen. Process for obtaining O_2-containing hydrocarbons.

Ger.P. 916,054, 24.6.54. — Ziegler, Mülheim. Method for producing terephthalic and phthalic acids.

Ger.P. 916,289, 1.7.54. — Schmitz, assr to Ruhrchemie AG, Oberhausen. Process for continuous sulphonation of liq hydrocarbons.

BrennstChemie, 1954, **35** (13–14). R. T.

COAL, SHALE, AND PEAT

115. Ultra-red spectra of coals. G. Bergmann *et al.* *Brennst-Chemie*, 1954, **35** (11–12), 175–6.—The applicability of the KBr press-method to substances from vegetable raw materials to anthracite is illustrated by the infra-red spectra presented and discussed. Spectra of thermally and chemically treated coals are included. R. T.

116. International peat symposium. T. F. Hurley. *Nature, Lond.*, 1954, **174**, 483–5.—Report of a meeting held in Dublin, July 1954.

For use as fuel the two problems are: (*a*) how to dry the peat; (*b*) in what apparatus to burn it. 3 methods of drying are briefly described: (1) the sod peat process; (2) the milled peat process; (3) the Madrück process, in which peat powder is mixed with wet peat and the mixture subjected to sustained pressure. Special forms of furnaces for burning peat are now in use, in which some at least of the milled peat is burned in suspension. For burning sod peat the most satisfactory method is to introduce all the combustion air as a high velocity jet on the top surface of the fuel bed. The use of peat as a gas turbine fuel is attractive. In the open cycle set the main problems are those of blade abrasion, corrosion, and ash deposition. These are avoided in the closed cycle set, but here elaborate heat exchangers and associated equipment are required.

Consideration was also given to the possibilities of peat as a raw material for the plastics industry, and of the gasification of peat to make water gas or synthesis gas. H. C. E.

MISCELLANEOUS PRODUCTS

117. The structure of oils and resins: spectroscopy. N. H. E. Ahlers and L. A. O'Neill. *J. Oil Col. Chem. Ass.*, Oct. 1954, **37** (412), 533.—Present knowledge on the structure of oils and resins is reviewed. Outstanding problems and the possibility of solving them by newly developed techniques are discussed. The technique considered in detail is absorption spectroscopy. D. K.

CORROSION

118. Oil well casing corrosion and its prevention. J. Wojnar. *Nafta* (*Krakow*), 1953, **9**, 255–7.—The corroding effect of sulphur and its compounds is not important in Polish crudes, where there is little of them. The Polish I.P. is carrying on work on corrosion of gas-carrying pipelines. Corrosion may be fought by coating the pipes or by using synthetic materials or stainless steel. Due to high weight of pipes they are mostly coated. Either plastic or corrosion resistant metallic coats may be applied. V.C. and P.V.C. are used for pipes carrying mud. Phenolic resins are used for pipes carrying sour crude and for tanks. Best metallic surfaces are of nickel covered with chromium, but slight cracks in a metal like this will create a voltaic cell *in situ* with iron as the anode. Of the synthetic materials 2 are mentioned: asbestos + cement, and faolite with fillings. Some details of manufacture of asbestos-cement and Soviet standard specifications are given. Faolite may be used with sand or asbestos filling. 5 examples of stainless steels are given. M. S.

119. Non-destructive testing detects corrosion damage. F. A. Prange and J. F. Headrick. *Oil Gas J.*, 27.9.54, **53** (21), 82.—A survey is presented of test methods for detecting corrosion, including visual and electrical. Ultrasonic devices and fluorescent or colour penetrating dyes are dealt with in the brief review. G. A. C.

120. Cut de-ethanizer corrosion 92%. Anon. *Petrol. Process.*, 1954, **9** (8), 1192–3.—Organic chemical inhibitors capable of preventing corrosion because of their filming properties are described in this article. The nitrogen atoms of the inhibitor molecule are adsorbed on the metal surface to be protected, resulting in a molecularly-thin film or barrier. The quantity required is exceedingly small; in the range of 3–22 p.p.m., depending on local conditions. J. W. H.

ENGINES AND AUTOMOTIVE EQUIPMENT

121. Engine stalling. P. H. Schweitzer. *Auto. Engr*, July 1954, **44** (7), 285.—The stalling behaviour of engines in general and diesel engines in particular are comprehensively studied. The mechanics of stalling, factors influencing engine stability, and speed-delivery characteristics of injector pumps are discussed and the principles of various governors are described. Numerous graphs are included. 6 refs. T. T.

SAFETY PRECAUTIONS

122. New fire-fighting equipment. Anon. *Petrol. Times*, 1.10.54, **58** (1491), 1013.—A demonstration is described of a wide range of fire-fighting equipment, given by the National Fire Protection Co at Feltham, Middlesex. First-aid portable appliances and larger works self-actuating types with a wide range of extinguishing agents were shown. G. A. C.

MISCELLANEOUS

123. Allocation of costs between petroleum liquids and gases. E. E. Hunter. *J. Petrol. Tech.*, July 1954, **6** (7), 11–13.—Known natural gas reserves in the U.S.A. approx doubled in the 10 years ending 1952, being nearly 200×10^{12} cu. ft. in 1953. The heat value of this is equal to that of the 28×10^9 brl of crude and 5×10^9 brl of condensate reserves known at that time. However, the oil output in 1952 represented twice as many heat units as the gas production. Gas demands have increased rapidly since the end of the war, giving marked rises in price, despite increasing reserves. Thus in the SW., prices doubled from 1943 to 1951, averaging 5·6 c/m.c.f. in 1951. U.S.A. production in 1951 exceeded 8×10^{12} cu. ft. Good accounting practice and business prudence require that gas be no longer treated as a by-product, and a proper allocation

of costs be made to crude oil, casinghead gas, gas-well gas, and condensate. However, intermingled production precludes exact allocation.

Humble Oil and Refining Co have considered 2 possible procedures. In the realization method it is assumed that costs incurred are proportional to sales value. However, this makes no attempt to fix a selling price which carries a reasonable share of the total costs. The energy content method implies that costs should be diviaible in relation to the energy content of the co-products. However, some products attract prices not in line with their heat value.

Gas-well gas delivered at 15 c/m.c.f. on the Gulf Coast has a realization for B.Th.U. of only half that of fuel oil, its chief competitor, but costs directly attributable to producing activity are substantially less for gas wells than oil wells.

The energy content method can be modified to meet particular cases. Casinghead gas may be allowed some credit for its aid in lifting oil. Indirect costs are usually divided in proportion to direct costs. Exploration costs may be allotted in proportion to energy content.

Recycled or spent gas must be excluded from production, and the same is true for flared gas.

The methods seem better for an overall company basis than for single fields or leases. G. D. H.

124. U.S. Bureau of Mines research on synthetic liquid fuels. Anon. *Petrol. Times*, 1.10.54, **58** (1491), 1011.—Pt I—Oil from Coal—of the Bureau of Mines Report for 1953 is reviewed, in particular the run on the liq-phase unit of the demonstration coal hydrogenation plant at Louisiana; the development of a simpler and cheaper form of coal hydrogenation, studies on coal structure, and the gas-synthesis demonstration plant. G. A. C.

BOOK REVIEWS

Some Fundamentals of Petroleum Geology. G. D. Hobson. London: Oxford University Press, 1954. Pp. x + 139. 18*s*.

A British contribution to the literature of petroleum geology is most welcome in a field which, for obvious reasons, is largely the preserve of American authors. Dr Hobson presents in five chapters, supplemented by three appendices, an analytical account of the fundamentals of petroleum occurrence. Principal discussion is given, after two preliminary chapters dealing with the nature of an oil accumulation and with reservoir fluids, to the origin of petroleum and to migration and accumulation. The last chapter deals with reservoir pressure.

The author acknowledges his indebtedness to Professor Illing, whose energetic lead and instruction in tackling these problems of petroleum geology for over a quarter of a century have enabled many of his former students to play a significant part towards the success of oil companies, both British and foreign.

Each chapter of Dr Hobson's book deserves close attention: the subject-matter is expressed clearly with a refreshing economy of words. References given after each chapter may be expected to be available in any sound technical library, and should enable, not only the student, but also the maturer petroleum geologist, to follow those avenues of particular interest to him opened up by the author's stimulating exposition.

The addendum of the third appendix discusses two recent articles of the *Bulletin of the American Association of Petroleum Geologists*, while yet the gist of a later article by W. C. Gussow (*ibid.*, 1954, **38** (5), 816–53) on differential entrapment of oil and gas has already been covered in the chapter dealing with migration and accumulation. Clear line drawings, a useful index, and a foreword by Professor Illing provide a satisfactory setting for a handy work which deserves a wide audience. J. B. K.

World Petroleum Statistical Yearbook, 1953–54. Ed. Henry J. Struth. New York: Mona Palmer, 1954. Pp. 454. $20.

This is the first of an annual series to be produced with the aim of becoming, in the words of its editor, "the most complete and dependable source of international petroleum information available anywhere in the world." In fact, this volume does fill a gap in petroleum statistics by collecting together, into some 450 pages, statistics on all aspects of the world petroleum industry from trends and forecasts of supply and demand to tanker fleets and world crude prices.

Naturally the majority of the tables relate to the U.S.A., but, while the coverage of statistics for the rest of the world is much less extensive, some 50 pages are devoted to them. Outside the U.S.A. the emphasis is mainly on production, and information on the U.K., for example, is restricted to such items as imports from the U.S.A., crude oil production, tanker statistics, and refinery capacities. Apart from reasons of space, the lack of information on consumption, taxation, etc. (which is given in detail for the U.S.A.) appears to arise because the compilers have restricted themselves mainly to American sources of statistics. The sources of information are given at the foot of most tables—it would be preferable if they were given in all cases—and there is a very good cross-referenced index which greatly enhances the value of this book.

It is probably inevitable that, in the first edition of a work of this magnitude, there should be found room for improvement. Some tables are somewhat misleading, such as that on motor vehicles, which does not make clear that the total shown excludes certain types of vehicles, and the European Refinery table, for example, does not specify the units in which the capacities are shown. No doubt the editor will put such things right in the future, and if, as is hinted in the foreword, the scope of the work is enlarged in future editions, the petroleum industry has gained a very useful addition to its sources of information. H. E. B.

Methoden der Organische Chemie (Houben-Weyl) Vol. 7, Oxygen Derivatives. Pt. I. Aldehydes. 4th Edition. Ed. E. Muller. Stuttgart: Thieme Verlag, 1953. DM. 82.

The third volume to appear of the new edition deals exclusively with aldehydes. It is divided into 3 parts, the first of which consists of a very full review of methods of preparation, including both those of general application and those required for special compounds. Experimental details, which add greatly to the usefulness, are given for a large number of preparations. In the second part the functional derivatives of aldehydes are similarly treated and the methods of regeneration from such derivatives described. The third and final section, consisting of only 6 pages, deals mainly with the reactivity of aldehydes, their stabilisation and purification. A brief description of the preparation of optically active aldehydes and those containing isotopes is included.

This is a most valuable reference book which constitutes an important addition to the literature of organic chemistry. S. F. B.

ADDITIONS TO THE LIBRARY

Symposium on Temperature Stability of Electrical Insulating Materials. A.S.T.M. Special Technical Publication 161. Philadelphia, Pa., U.S.A.; A.S.T.M., 1954. Pp. 141. $2.75.

Held in June 1954 this symposium presented 11 papers on various aspects of the thermal stability of insulating materials—plastics, fabrics, micaceous materials, varnishes, and silicone-treated glass fabric.

A Selected Annotated Bibliography of Natural Gas. R. C. Henshaw. Texas: University of Texas, Bureau of Business Research, 1954. Pp. 61. $1.50.

A useful bibliography of natural gas divided under 9 headings: economics, liquids, petrochemicals, reserves, transport and storage, taxation, public control, conservation, and competitive fuels.

Symposium on Diesel Fuels. A.S.T.M. Special Technical Publication 167. Philadelphia, Pa., U.S.A.; A.S.T.M., 1954. Pp. 56. $1.50.

This symposium was held in Philadelphia in February 1954 and the 9 papers included discuss diesel fuel availability and demand, use of furnace oils, distribution and storage, availability at roadside stations, technical problems in use by contractors, by coach operators, and by railroads, marine uses, and specification requirements.

Natural Gasoline Association of America. Proceedings, 33rd Annual Convention.

In the eight technical sessions of the NGAA convention at Dallas, Texas, in April 1954, 29 papers were presented, and these are reproduced in this report. The sessions dealt respectively with compression, transport, gas flow, corrosion, gas treating, LP gases, natural gasoline and motor fuels, and tray design. The general sessions included the Hanlon Award Address and the presentation of the award, the "Report of the National Council for LP-gas Promotion," and an address by the President of the CNGA.

British Standards:

B.S. 593 : 1954. Laboratory Thermometers. Pp. 24. 4*s*. net, post free.

B.S. 619 : 1954. Incubator, Water Bath, and Oven Thermometers for Laboratory Use. Pp. 9. 2*s*. 6*d*. net, post free.

B.S. 620 : 1954. Dimensions of Grinding Wheels and Segments of Grinding Wheels. Pp. 41. 6*s*. net, post free.

B.S. 1428 : 1954, Pt. 61. Heating and Cooling Blocks for Microchemical Purposes. Microchemical Apparatus Group 6: Heating, Cooling, and Drying Accessories. Pp. 13. 2*s*. 6*d*. net, post free.

B.S. 2070 : 1954. Large Nitrometers. Pp. 12. 2*s*. 6*d*. net, post free.

B.S. 2455 : 1954. British Standard Methods of Sampling and Testing Boiler Water Deposits. Pp. 45. 6*s*. net, post free.

B.S. 2485 : 1954. Tee Slots. Pp. 20. 3*s*. 6*d*. net, post free.

B.S. 2486 : 1954. Treatment of Water for Land Boilers. Pp. 38. 6*s*. net, post free.

B.S. 2491 : 1954, Pt. I. Domestic Cooking Appliances for Use with Butane–Propane Gases. Pt. I: Appliance for Use with Butane Gases. Pp. 22. 6*s*. net, post free.

ABSTRACTS

	PAGE
OILFIELD EXPLORATION AND EXPLOITATION	
Geology	18 A
Geophysics and Geochemical Prospecting	19 A
Drilling	19 A
Production	20 A
Oilfield Development	22 A
TRANSPORT AND STORAGE	23 A
REFINERY OPERATIONS	
Refineries and Auxiliary Refinery Plant	23 A
Distillation	24 A
Absorption and Adsorption	24 A
Solvent Extraction and Dewaxing	25 A
Cracking	25 A
Hydrogenation	26 A
Chemical and Physical Refining	26 A
Special Processes	26 A
Metering and Control	27 A
PRODUCTS	
Chemistry and Physics	28 A
Analysis and Testing	28 A
Crude Oil	29 A
Gas	29 A
Engine Fuels	29 A
Gas Oil and Fuel Oil	30 A
Lubricants	30 A
Bitumen, Asphalt, and Tar	31 A
Special Hydrocarbon Products	32 A
Derived Chemical Products	32 A
Coal, Shale, and Peat	32 A
Miscellaneous Products	33 A
CORROSION	33 A
SAFETY PRECAUTIONS	34 A
MISCELLANEOUS	34 A
BOOK REVIEWS	34 A
ADDITIONS TO THE LIBRARY	36 A

AUTHOR INDEX

The numbers refer to Abstract Numbers

Anderson, E. D., 186
Argo, W. B., 185
Armstrong, T. A., 134
Arndt, —, 198
Aronofsky, J. S., 149
Atlas Powder Co., 264
Atwood, J. S., 218

BASF AG, 191, 209–10, 218, 238, 254, 264
Baker, E. R., 254
Balekjian, G., 224
Bär, —, 210
Barson, N., 199
Bartholme, —, 238
Bayerlein, —, 213
Beard, L. C., 251
Beaubien, S. J., 252
Beck, G., 230
Beckman, R. B., 197
Bell, E. R., 254
Bellah, J. S., 232
Bender, M. J., 205
Berg, —, 218
Berg, C. H. O., 218
Bergwerks-AG, 270
Bergwerksverband zur Verwertung von Schutzrechten der Kohlentech G.m.b.H., 213
Berti, V., 201
Bertolini, F., 190
Bertuzzi, A. F., 150
Beyer, G. H., 194, 199
Bischoff G.m.b.H., Gottfried, 202
Bocholt, —, 258
Böhme Fettchemie G.m.b.H., 265
Bowden, S. T., 228
Bozeman, J. F., 164
Brannen, C. G., 247
Brannon, H. R., 125
Brown, J. W., 218
Brunstrum, L. C., 247
Bryant, C. M., 153
Büchner, —, 198, 213
Burner Manufacturers Association, 240
Burnside, H. E. W., 218
Burrows, D. B., 151

California Research Corpn., 276
Callaway, F. H., 165
Canzler, —, 218
Caron, J. B. R., 241
Carr, N. L., 151
Cataldi, M. A., 273
Cattaneo, A. G., 252
Cauley, J. E., 192
Celanese Corpn of America, 254
Chem. Verwertungsges Oberhausen m.b.H., 218
Chem. Werke Hüls AG, 198, 209
Chenicek, J. A., 254
Cier, H. E., 218
Clark, G. H., 282
Coghlan, C. A., 218
Cohen, R. M., 194
Collin AG, F. J., 213
Comley, E. M., 215
Conley, J. P., 264
Continental Oil Co., 254
Cowling, J. E., 175
Cross, S. T., 264
Crowley, D. J., 226

Danforth, J. D., 205
Daniels, —, 238
Danulat, —, 213
Darling, S. M., 239
Davie, F. E., 272
Davis, P. C., 150
Dazzi, J., 265
Dehydag Deutsche Hydrierwerke G.m.b.H., 258
Denker, —, 235
de Free, D. O., 239
de Rosset, A. J., 218
Deutsche Erdöl AG, 202
Deutsches Hydrierwerk Rodleben VEB., 198
Deutsche Shell AG, 264
Dickinson, N. L., 218
Distillers Co., 218
Doble, F. C., 261
Donnelly, H. G., 222
Doolittle, A. K., 227
Dorschner, —, 209, 238
Douglas Aircraft Co., 254
Dow Chemical Co., 218
Dravnieks, A., 273
Duff, D. M., 139
Dunning, H. N., 225, 237
du Pont de Nemours and Co., E. I., 265
Dyes, A. B., 162

Edeleanu-Ges m.b.H., 202
Egloff, G., 280
Elche, —, 258
Eisenwerke Gelsenkirchen, 258
Ellis, S. R. M., 234
Enault, Y., 260
Enright, R. J., 163
Esso AG, 202
Ethyl Corpn., 239

Field, E., 218
Finch, H. de V., 218
Flaxbart, E. W., 186
Fleming, J. P., 196
Flesch, —, 238
Forster, E. O., 248
Fortess, F., 254
Frye, C. G., 218
Furman, K. E., 218
Fütterer, —, 191

Gamulczynski, J., 144
Garbo, P. W., 218
Gardner, F. J., 129, 176
Garner, F. R., 214
Garvin, W. W., 159
Geiser, N., 218
Gellert, —, 218
Gelsenkirchener Bergwerks AG, 258
Gemassmer, —, 218
Ghublikian, J. R., 206
Gilbert, E. E., 216
Gladfelter, R. E., 165
Glendenning, E. B., 241
Glogoczowski, J. J., 141
Göggel, —, 191
Gore, T. L., 150
Greenfeld, S. H., 256–7
Greenhalgh, R. E., 218
Grierson, R. A., 263
Gross, —, 210, 238
Grosskinsky, —, 213
Grundmann, —, 258

Hadley, D. J., 218
Haenzel, V., 208
Hagemann, —, 198
Hamer, J. P., 242
Harpener Bergbau AG, 213
Harrison, E., 154
Hatfield, J. A., 179
Hayes, G. L., 254
Heinrich, R. L., 254
Heinzel, —, 191
Henkelekian, H., 188
Herbert, —, 202, 213, 238
Herbert, E. Le Q., 183
Hesain, T. D., 167
Heuer, G. J., 161
Higgins, R. V., 157
Hill, E. F., 239
Hill, P. W., 272
Hillyer, J. C., 265
Hockel, —, 258
Hoehne, K., 266
Hoffman, A. E., 254
Hoffmann, H., 266
Hoot, C., 128
Hoppe, —, 202
Howell, W. C., 264
Hubmann, —, 213
Hughes, E. C., 239
Hydrocarbon Research Inc., 218

I.G.I., 218
Irisarry, O. B., 137
Iverson, R. L., 214

Jacobs, D. J. H., 218
Jaeger, J. J., 243
Jäger, —, 265
Jahnentz, —, 198, 209
Jennings, L. A., 264
Johnson, H. F., 196
Johnson, J. W., 249
Joklik, —, 238
Jones, E. P., 216
Josse, H., 260

Katz, D. L., 148, 222, 224
Kay, J. H., 211
Kellogg Co., M. W., 218
Kemler, E. N., 147
Kieschnick, W. F., 154
Kiguchi, S. T., 195
Kinney, B. E., 226
Klein, —, 264
Kleinschmidt, L. R., 255
Klemm, —, 209
Klönne, Fa., 180
Knowles, W. S., 265
Kobayashi, R., 151
Kölbel, —, 264
Kolfenbach, J. J., 249
Kolling, —, 209
Komarewsky, V. I., 212
Koppers G.m.b.H., 198, 238
Kornfeld, J. A., 131, 169
Krebs, —, 202
Krebs, R. W., 218
Krekeler, —, 218
Kretzschmann, —, 198
Kroger, —, 213
Kurata, F., 150

Lane, S. C., 218
Lehrer, —, 238
Leibson, I., 197
Leithe, —, 238
Lester, C. B., 177
Levy, N., 218
Levy, W. J., 278
Lewis, W. K., 239
Lindahl, E. C., 219
Logan, K. M., 274
Lorenz, —, 238
Loughry, T. F., 204

McCabe, L. C., 281
McCloud, D. M., 276
McCutchan, P., 235
McGowan, F. L., 264
McGrath, H. G., 218
McGuire, W. J., 154
Madsen Iron Works, 258
Madsen, W. M., 258
Manci, C., 201
Mann, F. W., 275
Mantell, R. M., 218
Maples, B. E., 233
Mardock, E. S., 155
Martin, —, 218
Martin, W. L., 223
Mayland, B. J., 215, 218, 220
Messer G.m.b.H., Adolf, 258
Metallges AG, 198, 202, 209, 215, 238
Metzger, —, 254
Metzner, A. B., 189, 229
Mewes, —, 238
Michael, —, 209
Mikeska, L. A., 254
Monicard, R., 126
Monsanto Chemical Co., 265
Moon, L. B., 178
Moore, G. Z., 192
Moran, J. P., 164
Moreton, D. H., 250, 254
Morris, W. E., 232
Morrisey, N. S., 130, 133, 168
Mottern, H. O., 218
Mougey, H. C., 246

National Petro-Chemicals Corpn., 218
Newberg, A. H., 174
Nicewander, D. A., 265
Noaker, L. J., 148
Nougaro, J., 126

Obergfell, P., 206
Obuchowicz, Z., 145
Ostaszewski, J., 143
Otto & Comp., G.m.b.H., Dr C., 238

Parsons, W. A., 188
Pasino, H. J., 218
Pawlik, —, 235
Pechstein, —, 180
Perkins, F. M., 125
Phillips Petroleum Co., 218, 220, 265
Pietkiewicz, R., 142
Pilz, —, 238
Pitzer, E. W., 207
Popkin, A. H., 254
Power, H. H., 161
Pratt, R. S., 218
Puschhof, S., 218

Rambo, M. L., 218
Rearick, J. S., 181
Reich, —, 209
Reichswerke AG, 235
Resen, F. L., 146
Reynolds, J. C., 215
Rheinpreussen AG, 209, 264
Rice, T., 203
Ritch, H. B., 158
Roberts, C. H., 167
Robinson, S. P., 218
Roelen, —, 238
Rohrback, G. H., 276
Rössig, —, 254
Rottig, —, 202, 209–10
Royen, —, 210, 238
Rubin, L. C., 218
Ruhrchemie AG, 198, 202, 209–10, 213, 218
Rüping, —, 213
Ryan, J. G., 254

Salomon, T., 262
Schade, —, 213
Schafer, —, 202
Scheibel, E. G., 209
Schenk, —, 210
Schiller, W., 160
Schlaer, J. J., 264
Schlumberger, —, 258, 270
Schneider, —, 258
Schnur, —, 198
Schulte, —, 258
Schutse, H. G., 218
Schwarz, —, 198
Schwegler, C. C., 218
Scott, W. R., 276
Sedijatmo, R. M., 176
Sheldon, J. W., 159
Shell Development Co., 218, 241, 254
Shepherd, W. C. F., 221
Shmidl, A. J., 254
Shock, D. A., 271, 275
Siebert, —, 199
Sinkranek, C., 201
Smith, J. M., 185

Smith, P. V., 254
Soderquist, F. J., 218
Springer, —, 213
Standard Oil Co., 218, 239, 254
Standard Oil Development Co., 218, 241, 254, 264
Stanolind Oil and Gas Co., 218
Steinitz, E. W., 245
Stephenson, R., 193
Sterbo, M. J., 208
Stewart, F. M., 165
Stickdorn, —, 258
Still, Fa., 258
Stock, —, 202
Stormont, D. H., 166
Strzelbicki, J. T., 152
Sudbury, J. D., 172, 275
Swakon, E. A., 247
Szadkowski, K., 187
Teeters, W. O., 218
Tennant, F. M., 218
Terres, E., 267
Texas Co., 218
Thorpe, R. E., 254
Tinner, —, 198
Totzek, —, 238
Tramm, —, 209, 258
Tramm, H., 218
Trexel, J. J., 241
Tutwiler, T. S., 242
Uhl, P. W., 283
Umbach, —, 213
Union Oil Co. of California, 218, 235
Universal Oil Co., 218
Universal Oil Products Co., 254
van Winkle, M., 192, 223
Vincent, G. H., 218
Vogel, —, 258
von Schuchmann, —, 265
Wallick, G. C., 149
Watkins, J. W., 155
Watts, R. N., 218
Weller, —, 238
Weinmayer, V., 265
Weisel, C. A., 242
Weiss, H., 259
Wensel, —, 209, 218
Wessolek, —, 238
West, W. J., 159
Whalen, J. W., 156
Whitmore, H. E., 254
Wiedmann, —, 209
Wies, C., 241
Wilkinson, W. F., 206
Wilks, P. A., 217
Williams, R. B., 224
Willig, —, 202
Winsauer, W. O., 125
Woodcock, C. A., 218
Young, D. A., 235
Young, E. H., 224
Zajac, S. J., 254
Zerbe, —, 264
Ziegler, —, 218
Zorn, —, 254

OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

125. Interrelation of resistivity and potential of shaly reservoir rocks. F. M. Perkins, H. R. Brannon, and W. O. Winsauer. *J. Petrol. Tech.*, Aug. 1954, **6** (8), AIMME Tech. Paper No. 3877, 29–34.—Shaly reservoir rocks exhibit abnormal resistivity due to the adsorption of ions, and their potentials are also affected. The theory of the relationships between their resistivity and the adsorptive properties and between the Mounce potential and these properties is given and a relationship between potential and the resistivity factor is derived. The resultant equations were tested by means of lab measurements, and satisfactory agreement was obtained. An indirect check was applied via the porosity of the rock specimens used.

The relationships derived can be applied qualitatively to estimate whether or not a shaly rock contains oil or gas, but they must be applied with caution, because the data they require are subject to errors of measurement. Furthermore, they need to be checked against field results under varying conditions. G. D. H.

126. Techniques of deep exploration in the search for oil: instantaneous diagraphy. J. Nougaro and R. Monicard. *Rev. Inst. franç. Pétrole*, Aug. 1954, **9** (8), 449–74.—Various forms of logging yield logs which are diagrams or curves showing the variation in the parameter measured. The word diagraphy has been introduced to denote the operations which yield the diagrams.

Conventional logging and allied operations involve diagraphy after drilling. Instantaneous diagraphy refers to the operations going on during drilling. Instantaneous diagraphy comprises the measurement of gas or oil in drilling mud; comparable measurements on drill cuttings; measurement of the physical properties of the mud, and of the cuttings; measurement of the rate of advance of the bit. The detection and measurement of the hydrocarbons in drilling mud are discussed in considerable detail, and using various methods. The examination of cuttings for hydrocarbons is also described, as are the determination of certain mud properties, and the study of the lithology of cuttings.

Methods for measuring the rate of advance of the bit, and the factors which affect this rate, are discussed, together with the presentation and interpretation of the data obtained in instantaneous diagraphy. G. D. H.

127. Offshore strike made. Anon. *Oil Gas J.*, 5.7.54, **53** (9), 102.—53 State 948 on a 21-hr test of upper Frio sand at 7760 ft produced 214 b.d. of 39·5° oil with a GOR of 467.

This is the first commercial discovery on the Texas Continental Shelf since the Tidelands Act of 1953. Depth of water is 38 ft, and the well is 23 miles SE. of Corpus Christi. C. A. F.

128. Ranch hope gets boost. C. Hoot. *Oil Gas J.*, 28.6.54, **53** (8), 88.—A third discovery in the Dora Roberts ranch area indicates the possibility of a large Ellenburger structure in SW. Midland County, Texas. The area is between Headlee and Peck and Pegasus fields.

The discovery well, 1 Roberts C-4 was completed for 3205 b.d. from the Ellenburger topped at 13,076 ft. C. A. F.

129. Sara—largest Devonian structure. F. J. Gardner. *Oil Gas J.*, 7.6.54, **53** (5), 153.—Development of a prolific field in Gaines County in the W. Texas Permian basin is promised, and may prove to be on the largest Devonian structure yet found in the basin. The field discovery, I Stanton Brunson, was completed in Devonian at 12,674–12,728 ft with an initial production of 1868 b.d., but a subsequent well flowed over 3000 b.d. from the same pay. C. A. F.

130. Cambrian has the stage in West Texas. N. S. Morrisey. *Oil Gas J.*, 5.7.54, **53** (9), 116.—Cambrian pay was discovered in West-Central Texas in 1953 at White Flat field, and 7 fields are now producing from the Wilberns dolomite and the Hickory (?) sandstone. Up to 142 ft of permeable sand have been cored, but pay thickness is very variable, due to erosion, distance above oil–water contact, and lithological changes. Reserves are considered substantial.

The producing structures are similar and consist of north–south-trending Cambrian anticlines at *ca.* 6000–7000 ft, with a major fault on the eastern flank parallel to the axial crest and upthrown to the west. There is low relief structure in the overlying Pennsylvanian beds, which rest on the deeply eroded Cambrian.

Source of the oil is uncertain, but it is believed by some to have originated in the Pennsylvanian.

Most of the producing areas cover less than one sq. mile, but further extensive development is anticipated. C. A. F.

131. Danger below! Abnormal reservoir pressures. J. A. Kornfeld. *Oil Gas J.*, 14.6.54, **53** (6), 136.—Abnormally high pressure zones occur in a 50-mile-wide belt along the Gulf Coast plain from the Rio Grande to the Mississippi delta. Drilling control in these areas is difficult, as there is an abrupt increase in pressure above hydrostatic normal over a very short vertical interval.

Abnormal pressures are said to occur commonly only below the base of main sand developments in or below a major shaly series. The main facies change from sand to shale is at the base of the Frio in S. Louisiana, but it rises stratigraphically in the Mississippi delta area. C. A. F.

132. Test finds gas. Anon. *Oil Gas J.*, 19.7.54, **53** (11), 78.—A wildcat 32 miles offshore from Cameron Parish, Louisiana, found an estimated 2,500,000 cu. ft. gas/day from *ca* 9000 ft. Total depth is *ca* 14,000 ft, and pay is reported to be Miocene sand.

Depth of water is 60 ft, and nearest production is a gas well 25 miles to the NW. C. A. F.

133. Oil Creek—rich pay zone for Southern Oklahoma. N. S. Morrisey. *Oil Gas J.*, 21.6.54, **53** (7), 215.—Production was first found in the Oil Creek Sand in S. Oklahoma in 1940, and several new fields recently found have indicated that the pay may be extensive.

The Oil Creek, which is basal Simpson, is a sheet sand of considerable extent, and produces locally in complexly folded and faulted anticlines which parallel the Wichita and Arbuckle trends. These structures are difficult to detect, as they are masked by overlying Strawn beds and require detailed seismic investigation. C. A. F.

134. Diving for oil off California. T. A. Armstrong. *Oil Gas J.*, 5.7.54, **53** (9), 104.—Operations of a group of Californian geological diving consultants are outlined.

The group has carried out submarine geological work off the Californian coast. It has claimed remarkable success in mapping offshore structures, and faults have been traced. Many oil seeps have also been found, one of which is comparable in size to the La Brea tar pits.

Much of the work is in areas where seismic is confusing. C. A. F.

135. Four wildcats hit. Anon. *Oil Gas J.*, 12.7.54, **53** (10), 75.—4 wildcat discoveries are reported from W. Canada. These are Buick Creek No. 3, which is 23 miles north of Fort St John in British Columbia and recovered 2780 ft of oil on test from Nikanassin at 3884–3912 ft; a test in the Ebor area of Manitoba, which recovered light oil from 2715 ft; a test in the Atlee area of SE. Alberta, which tested 4,210,000 cu. ft. gas/day at 2663 ft; and a small Viking gas sand discovery in the Verendrye area of W. Saskatchewan.

The Buick Creek well may have proved the first discovered major oilfield in British Columbia. C. A. F.

136. Trinidad test spudded. Anon. *Oil Gas J.*, 19.7.54, **53** (11), 84.—The first offshore well is being drilled in the Gulf of Paria, 6 miles from Cedros Point off the SW. coast of Trinidad. Depth of water is 40 ft, and the well has been sited following gravity and seismic work. C. A. F.

137. Cuban picture hazy. O. B. Irizarry. *Oil Gas J.*, 28.6.54, **53** (8), 95.—Information obtained from the Jatibonico wildcat completed in central Cuba in May 1954 is discussed.

The well is producing from Upper Cretaceous conglomerate overlain by Eocene limestone; it is uncertain whether the oil is indigenous or has migrated from older beds.

32 horizons were reported to have shown oil impregnations, but only 3 were tested. Initial production was *ca* 250 b.d. of emulsion, but has since declined to 50–100 b.d. of 15°–17° oil.

The well is sited near a seepage area east of the old Jarrahueca field, which produced from shallow fractured serpentine.

Further drilling in this area is planned. C. A. F.

138. Peru test dry. Anon. *Oil Gas J.*, 21.6.54, **53** (7), 131.—Piura 2 in the Sechura Desert of Peru was abandoned in basement at 1778 ft. 7 failures have now been drilled in the area, but another well is planned near the coast at Paita.

Geological and geophysical work are planned for the Montana area east of the Andes, and aerial surveys are being made in the district. C. A. F.

139. Israel ready to drill. D. M. Duff. *Oil Gas J.*, 26.7.54, **53** (12), 150.—Considerable geological and geophysical work has been carried out in Israel, and a number of tests are planned.

The Mazal well in the Dead Sea area is at *ca* 1300 ft, and several oil and gas shows have been indicated.

A gravity high in the southern coastal plain near Beersheba, where there are gas seeps and sulphur impregnations, is to be tested after structure drilling.

The Caesarea anticline has been mapped by seismic work, and core drilling has been carried out. Another structure was found on Mt Carmel in Zichron Yakov, and a well is to be drilled here. C. A. F.

140. German wells tested. Anon. *Oil Gas J.*, 19.7.54, **53** (11), 85.—Ruehme 11, *ca* 5 miles north of Brunswick in W. Germany, on test flowed approx 150 b.d. of light oil from *ca* 2300 ft.

Oil has been discovered 6 miles west of Brunswick, where Vechelde 2A produced 50 b.d. on test between 6029 and 6052 ft.

Several wells have found gas in Bavaria near Munich. C. A. F.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

141. Shallow (surface) geochemical contour maps. J. J. Glogoczowski. *Bull. (Polish) Inst. Petrol.*, 1953, **3**, 11 (Suppl. to *Nafta* (*Krakow*), 1953, **9**).—Since 1949 the Potok anticline served as the testing ground for this new method. It has been found useful within limits, and the experimental work served also as training in the use of equipment. During 1950 the same area was fully tested, and samples taken then were tested for heavy and light hydrocarbons and for radio-activity. The maps produced were in agreement with known size of crude reservoirs. In 1952 a 12 sq. km. area of a Carpathian fold was explored using a net of sampling points 100–200 m apart. A borehole was started in that area, and careful coring provides more material. The area was extended by another 6 sq. km. into Magura plateau, and the anticline itself was further tested at 25–50 m intervals. Electrical methods of hydrocarbon analysis shorten the testing time by three-quarters.

During 1951 an area of 400 sq. km. was tested using fewer points, the aim being correlation of data and organization trials. M. S.

DRILLING

142. Packer for pressure cementing of oil wells. R. Piatkiewicz. *Nafta* (*Krakow*), 1953, **9**, 267–9.—To prevent cement from getting into the wrong annular space packers are very useful. One, designed by V. I. Dokumentov is described, with a drawing. Also given is the procedure of inserting it into position and subsequent cementing procedure. Reference to a Soviet work is given. M. S.

143. Well-bottom pressure gauge "CSN." J. Ostaszewski. *Bull. Polish Inst. Petrol.*, 1953, **3**, 12 (Suppl. to *Nafta* (*Krakow*), 1953, **9**).—Described with drawings. It is 1410 mm long, 33 mm dia, and weighs 5·5 kg. Working pressure can be adjusted from 1 to 200 atm. M. S.

144. Lime drilling mud. J. Gamulczynski. *Bull. Polish Inst. Petrol.*, 1953, **3**, 11–12 (Suppl. to *Nafta* (*Krakow*), 1953, **9**).—Since Na^+ is not as good as Ca^{++} for some purposes, the Polish Institute of Petroleum (Drilling Section) is working on a mud based on natural loams available. Additives are: NaOH, 0·5–1·0%; quebracho (or cellulose–sulphonic acid salts), 0·2–0·6%; lime, 0·7–3%; starch, 1–2%. pH must be *ca* 11·5. During conversion visc rises and then falls again. Resulting muds are very good. They are yet to be proved in boreholes. M. S.

145. Influence of mud filtrate on permeability of Krosno sandstones.—Z. Obuchowicz. *Nafta* (*Krakow*), 1953, **9**, 292–4.—Several boreholes which yielded cores saturated with crude did not yield any free-flowing oil. Low formation pressure and low porosity of the rocks may be the reason, but differential thermal analysis of the rocks indicates that the Krosno shales (marls) contain montmorillonite which contaminates local sandstones. This mineral absorbs water and thus lowers the permeability of the rock. Lab tests on crushed sandstone prove that saturation with dist water does not affect permeability of these rocks unless they contain pelite. Both kinds are affected by Na^+. Oil-base muds should therefore be employed. M. S.

146. New mud-driven drill collar increases penetration in Lea County well. F. L. Resen. *Oil Gas J.*, 19.7.54, **53** (11), 97.—Drilling mud is being used for transmitting weight to the drilling bit in a new tool designed to increase penetration rates. The pressure differential of the mud forces a telescoping member, to which is attached the bit, against the bottom of the hole so that a fairly constant weight is maintained.

Field tests in Lea County, New Mexico, have shown a 35% increase in penetration rate using the new method.

The equipment and procedure are described in detail, and a chart comparing drilling rates is included. C. A. F.

PRODUCTION

147. Mechanical engineering progress in the petroleum industry—petroleum production. E. N. Kemler. *Mech. Engng, N.Y.*, Aug. 1954, **76** (8), 640.—Recent developments in drilling techniques, automatic controls, offshore drilling barges, oil-recovery methods, and electronic computers are discussed. 34 refs. T. T.

148. Gas hydrates of hydrogen sulphide–methane mixtures. L. J. Noaker and D. L. Katz. *J. Petrol. Tech.*, Sept. 1954, **6** (9), AIMME Tech. Paper No. 3895, 135–7.—Hydrate formation by mixtures of hydrogen sulphide and methane was examined experimentally, observations being made at pressures in the range 150–970 p.s.i. and temp of *ca* 38°–72° F. The experimental procedure is described, and the results are presented on a pressure–temp diagram, for varying amounts of the 2 components, and on a temp–composition diagram for different pressures. The vapour–solid equilibrium constants are also plotted. G. D. H.

149. Effect of gas slip on unsteady flow of gas through porous media—experimental verification. G. C. Wallick and J. S. Aronofsky. *J. Petrol. Tech.*, Oct. 1954, **6** (10), 27–9.—Numerical solutions of the differential equation describing the transient flow of an ideal gas through porous material, allowing for slip effects, have previously been given. Experimental study has been carried out by mounting a low-permeability core in a rubber sleeve, connected with a vacuum or pressure source at one end, and a pressure gauge and variable dead vol at the other end. The pressure build-up or decline was recorded when the pressure at the other end was suddenly changed. Initial pressures were up to 16 atm. The experimental results agree well with the numerical solutions. However, deviations between experiment and theory for the earlier transient period suggest that further refinements may be needed in the theoretical formulation to extend the range of validity to higher gas velocities. G. D. H.

150. Phase and volumetric behaviour of natural gases at low temperatures and high pressures. P. C. Davis, A. F. Bertuzzi, T. L. Gore, and F. Kurata. *J. Petrol. Tech.*, Oct. 1954, **6** (10), AIMME Tech. Paper No. 3917, 37–43.—The phase and volumetric properties of 10 mixtures of natural gases and of mixtures of natural gases with methane and nitrogen have been studied at temp from −200° F to above the critical points and pressures up to 1400 p.s.i. The results are presented in tabular and graphical form. Existing correlations of compressibility factors have been extended to apply to these mixtures. Methods which apply to other volatile and very volatile mixtures have been developed for estimating the critical temp of these mixtures to ±4° F and critical pressures to ±5%. These methods are briefly described. G. D. H.

151. Viscosity of hydrocarbon gases under pressure. N. L. Carr, R. Kobayashi, and D. B. Burrows. *J. Petrol. Tech.*, Oct. 1954, **6** (10), AIMME Tech. Paper No. 3915, 47–55.—The visc of hydrocarbon mixtures in the liq or gaseous phase depends on the pressure, temp, and composition. Visc data on methane, certain multi-component mixtures, and gases with nitrogen have been correlated as functions of visc ratio, pseudo-reduced temp, and pseudo-reduced pressure. The visc ratios may be least certain in the region near $T_R = 1$ and $P_R = 1$. Measurements made on methane and propane in capillary and rolling-sphere viscometers are compared.

The application of the correlation to predict absolute visc is described, together with a means of calculating the visc of a mixture of gases and a method of obtaining gas visc from the gravity of natural gases. G. D. H.

152. Acidizing of gas producing wells. J. T. Strzelbicki. *Nafta (Krakow)*, 1953, **9**, 295–7.—Acid employed consists mostly of HCl with $CH_3CO{\cdot}OH$ (1–2%) and HF, but HNO_3 may form the main bulk. Gas producing wells were originally treated using oil or water plug, but new gas at higher pressure is commonly used. Better control is achieved, and several partial operations can be used. This is more effective. Quantities in ratio 1 : 3 : 6 or 1 : 3 : 4 are commonly used. The boreholes ought to be prepared by removing all metallic scrap from it. Acid must be prepared to lower its corrosive action and surface tension. Among the latter is $C_nH_{2n-1}ONa$ invented by the author. Prior to acidizing, the chosen and adjoining boreholes should be analysed. Ciezkowice sandstone contains *ca* 16% $CaCO_3$ and 4% $FeCO_3$, so it is suitable for such treatment. This may prove more effective and cheaper than drilling deeper. M. S.

153. Dye-photo tool: its operation and applications. C. M. Bryant. *J. Petrol. Tech.*, Oct. 1954, **6** (10), 13–16.—The dye-photo tool consists of a bailer for holding and releasing the dye, a photo-electric cell for measuring any change in light intensity in the conditioned section, and a sonic collar detector for depth measurements. The tool is electrically operated. The tool will pass through a standard $1\frac{29}{32}$-inch seating nipple. The section to be surveyed must be covered by water in the hole; there must be facilities for producing the well, and the well must be cleaned to total depth. The rate of water rise in the hole is measured, and the tool is run to bottom, measuring the normal light transmission of the water. The tool is slowly raised, and at the proper depth the dye is released and dispersed through the section to be surveyed. A survey is then made downwards through the conditioned section. A change in light intensity indicates water entry, and the run is repeated until the zone of entry gives the original translucency. A complete survey in a 3000-ft well may take under 3 hr. Casing leaks with water entry may be detected by spotting dye at successive positions and observing the behaviour. Permeability measurements can be made by observing the movement of the interface between dyed and clear water. Allowance must be made for changes in hole size. The tool may be used in both producing and injection wells in a flood pattern. G. D. H.

154. Mechanics of fracture induction and extension. E. Harrison, W. F. Kieschnick, and W. J. McGuire. *J. Petrol. Tech.*, Oct. 1954, **6** (10), AIMME Tech. Paper No. 3916, 45–6.—On the basis of theoretical and experimental studies it is concluded that pressure induced fractures may be horizontal when the fracturing pressure exceeds 1 p.s.i/ft, but this condition is seldom attained below *ca* 3000 ft. Vertical or near vertical fractures may arise for bottom-hole pressures below 0·7 p.s.i/ft. Soft shales and sands on the Gulf Coast may have horizontal stresses at *ca* 0·4 p.s.i/ft of depth. Hydraulically-formed fractures may be up to 1 inch in width in the later part of large vol treatments, and there are approx relationships between fracture extent, width, and volume. The bottom-hole pressure at which a fracture extends may be an indication of orientation, except when very high visc fluids are used. Hard, well-consolidated rocks have horizontal stresses of *ca* 0·33 p.s.i/ft, so vertical fractures may end on meeting non-brittle shales. G. D. H.

155. Use of radio-active iodine as a tracer in water-flooding operations. J. W. Watkins and E. S. Mardock. *J. Petrol. Tech.*, Sept. 1954, **6** (9), AIMME Tech. Paper No. 3894, 117–24.—Accurate evaluation of reservoir performance characteristics in water-flooding operations is desirable. Radio-active iodine has been used as a water tracer to determine flow rates and patterns between injection and producing wells, and the zones of excessive water-entry in producing wells.

The results of tests on 3 areas are described in considerable detail, with supporting logs and other data. In these cases preliminary tests were made with dye-tracers to ascertain the more suitable times for making the radio-active observations. Well-head and subsurface measurements were made. Iodine seems satisfactory in many respects if the transit time between the wells is comparatively short. G. D. H.

156. Magnetic susceptibility method for the determination of liquid saturation in porous materials. J. W. Whalen. *J. Petrol. Tech.*, Sept. 1954, **6** (9), AIMME Tech. Paper No. 3893, 111–16.—The design, construction, operation, and testing of

magnetic susceptibility measuring apparatus for determining the liq saturation of rock samples in relative permeability studies are described. The magnetic tracer used was cobaltous chloride as an approx 20% soln. An essentially linear response was noted when the indicated voltage was compared with the concn of the soln. The method seems to compare favourably with the use of radio-tracer techniques with low energy tracers.

The magnetic susceptibility method is simple and seems suitable for routine measurements of relative permeability. The saturation of the aq phase appears capable of measurement with an accuracy of 2%.

The results of relative permeability measurements on 2 samples of porous material are given. G. D. H.

157. Study of undersaturation during repressuring and supersaturation during flow of oil to wells. R. V. Higgins. *J. Petrol. Tech.*, Sept. 1954, **6** (9), AIMME Tech. Paper No. 3891, 127–33.—An attempt has been made to estimate the degree of non-equilibrium between oil and gas in a reservoir rock during flow of oil and gas to a well and during repressuring operations. Equations relating the depth of oil, the concn of gas in soln, and the time for the gas to diffuse are derived. For the systems considered the degree of undersaturation of the oil with gas would be negligible, because of the small quantity of oil through which gas diffuses in pores where some effective permeability to gas exists and the long time required to raise the pressure in a large reservoir by gas injection. A corresponding situation exists in a reservoir during flow to a well.

It is concluded that underground reservoirs, which have some effective permeability to gas also have virtually complete equilibrium between oil and gas so far as most reservoir engineering investigations are concerned, because the slow rate of flow and the short distances through which gas has to diffuse permits enough time for the gas essentially to saturate the oil completely. G. D. H.

158. Proven method for the control of incompetent sand formations. H. B. Ritch. *J. Petrol. Tech.*, Sept. 1954, **6** (9), 15–18.—Several methods of sand control have been tried in the Gulf Coast area, but some wells have proved troublesome, and the new technique was initially used on wells of this type.

Experiments are described in which the migration of 200–325 mesh sand into 20–40 and 40–60 mesh sands, and combinations of these, was studied. 40–60 mesh gave the best control, but a happy medium in control is needed if satisfactory productivity is to be retained.

Gel oil, gel acid, and gel water were considered as carriers, each being capable of carrying substantial amounts of sand, of being broken down in the well and giving high fluid loss. Gel oil was most commonly used. After cleaning the well a squeeze tube was run and set with the bottom of the tail-pipe 3–4 ft above the top perforation. The gel–sand mixture is pumped down and, when spotted on bottom, squeezed, the procedure being repeated until no more sand can be squeezed away. A screen liner is then run and additional sand packed between the liner and perforated casing.

The method has been successful in 85% of the wells treated. Some data relating to a series of treated wells are given. G. D. H.

159. Solution of the equations of unsteady state 2-phase flow in oil reservoirs. W. J. West, W. W. Garvin, and J. W. Sheldon. *J. Petrol. Tech.*, Sept. 1954, **6** (9), AIMME Tech. Paper No. 3892, 125.—The problem of the prediction of the behaviour of a gas and oil reservoir for a variety of producing programmes, was formulated mathematically many years ago, but a solution of the equations was not obtained because of their complexity. A digital method for solving the problem has now been devised, and calculations have been made on an electronic computer. Both radial and linear systems under solution-gas drive have been investigated.

The saturation near the well quickly drops to the critical gas saturation, and remains essentially at that value until the remainder of the reservoir attains that state. In the radial flow computation the average oil saturation of the reservoir at the time corresponding to the limit of economic production was 56·5%, and ultimate recovery was 6·86%. G. D. H.

160. Establishment of rational production conditions by measuring parameters of oil reservoirs. W. Schiller. *Nafta (Krakow)*, 1953, **9**, 269–73.—Scientific exploitation at optimum conditions requires the accurate data relating to the rock structure of the reservoir, its porosity, permeability, etc. Most important production data are the well bottom pressure before exploitation started and during exploitation and the fluctuations of crude level. Its slow rise indicates low permeability of the formation and may cause an error. This is avoided by obtaining these data at different experimental production rates. Production rates for gas water and crude are plotted against pressure differential and recalculated with respect to pipe dia at the constriction. For gas-lift, calculations are done according to Maximovich or A.Z.N.I.I. The first method uses changes in pipe dia, the second variations in gas pumped in per hr. For variation of pumping using well-bottom pump, stroke must be varied. The height of the pump above the bottom is of consequence too. The industry and the Institute have their own crews who are getting good results, although shortages and imperfections cannot be ignored. M. S.

161. Correlating device for predicting reservoir performance. G. J. Heuer and H. H. Power. *J. Petrol. Tech.*, Sept. 1954, **6** (9), 10–14.—Relative permeabilities determined in the laboratory fail to agree closely with those calculated from field production data, possibly because the latter are weighted averages relating to conditions in a large mass of rock.

Log–log plots of cumulative gas *vs* cumulative oil production are commonly linear (for gas-drive and partial water-drive fields). In these cases $\overline{Q}_g = a(\overline{Q}_o)^b$, b being between 0·5 and 2. Calculations based on Leverett's relative permeability data for specimens with 30% of water yielded a comparable linear relationship on a log–log plot. Subsequently data from the log–log cumulative relation in the case of the Schuler field were used to calculate the relative permeability (gas to oil) at different oil saturations, and this was compared with values calculated from production data. G. D. H.

162. Production of water-driven reservoirs below their bubble point. A. B. Dyes. *J. Petrol. Tech.*, Oct. 1954, **6** (10), AIMME Tech. Paper No. 3918, 31–5.—Laboratory tests on 2 types of sandstone from one reservoir have shown that the creation of free gas bubbles leads to greater oil recovery under water-drive. The tests revealed that the specimen giving the poorest recovery under water-drive with no free gas had the greatest improvement when free gas was present. Calculations have also been made of the benefits to be expected from evolved gas in a low-shrinkage crude undergoing water-drive, for various reservoir pressures below the bubble point. These indicate an optimum pressure for water displacement which is several hundred pounds below the bubble point. The use of this optimum pressure could give 7–12% more oil than displacement at the bubble point. This magnitude of improvement may be worthy of consideration in planning producing rates in many water-drive fields. G. D. H.

163. Atlantic boosts recovery with high-pressure gas. R. J. Enright. *Oil Gas J.*, 5.7.54, **53** (9), 94.—Initial high-pressure gas-injection in the University Block 31 Devonian reservoir in Crane County, W. Texas, has proved very successful, and it is estimated that ultimate recovery will be 52% of the oil in place. Recovery from the area swept is *ca* 90%.

It is estimated that water flooding would have recovered 40% of oil in place, and the cost would have been more due to the larger number of injection wells required.

Field production was approx 3600 b.d. in 1949 when injection started and before the field was developed. In October 1952, when pressure-maintenance was fully operating, production was 10,000 b.d., and has since increased to 13,500 b.d. under injection. C. A. F.

164. Fracturing boosts production in southwest Texas. J. F. Bozeman and J. P. Moran. *Oil Gas J.*, 28.6.54, **53** (8), 105.—Stratafra has been applied successfully to the soft formations of SW. Texas; substantial and sustained increases in production have been obtained.

In the Stratafrac process, viscous, sand-laden fluid is introduced to a hydraulically created fracture in the producing formation; the carrier fluid then loses its visc and sand is deposited in the fracture as a propping agent. The viscous fluid is Jel X.100, consisting of a hydrochloric acid–kerosene gel mixed to a controlled visc.

Field procedure is to pump oil into the formation until it breaks down and then to introduce the gel. Fracturing pressures average 0·75–0·77 p.s.i. per foot of depth at the formation.

3 refs are given. C. A. F.

165. Comparison of methods for analysing a water-drive field, Torchlight Tensleep reservoir, Wyoming. F. M. Stewart, F. H. Callaway, and R. E. Gladfelter. *J. Petrol. Tech.*, Sept. 1954. **6** (9), AIMME Tech. Paper No. 3889, 105–10.—The oil in place in the Tensleep reservoir at Torchlight has been calculated by several different methods, and the general results and the prediction of the reservoir behaviour are given. This small pool has had its pressure kept well above the bubble point by an effective water drive.

Except for the pore-volume calculation, none of the different techniques gave a reliable figure for oil in place, or satisfactory data on future performance, when based on information available during the first 2 years of the development. Material balance methods were directly influenced by the allowance made in the water-influx term for transient conditions in the aquifer. Thus the Modified Schilthuis method was seriously in error, and the Simplified Hurst method appreciably in error. Performance predicted by the electric analyser was not reliable, due to uncertainty about the extent of the aquifer, when based on early data. G. D. H.

166. California's textbook oilfield. D. H. Stormont. *Oil Gas J.*, 21.6.54, **53** (7), 112.—The North Coles Levee Field in the San Joaquin Valley, California, was discovered in 1938, and has been under pressure maintenance since 1942.

The entire structure is controlled by one company, and the field has been produced to give max ultimate recovery. It is planned to sweep high pressure gas through gas-invaded parts of the reservoir, and it is expected that most wells will be flowed to depletion.

Initial b.h.p. was 4000 p.s.i., and secondary recovery was introduced when it fell to 3350 p.s.i. following natural gas-cap drive. Ultimate yield is estimated at approx 300 brl/acre-ft. C. A. F.

OILFIELD DEVELOPMENT

167. 75 rigs active in one Pennsylvania gas field. C. H. Roberts and T. D. Hessin. *Oil Gas J.*, 7.6.54, **53** (5), 154.—High gas prices have stimulated development of the Leidy gas field in north-central Pennsylvania, discovered in 1950.

371 wells have been spudded in the field, which produces from Oriskany sand, 12–40 ft in thickness; average open flow was approx 7½ M.M.c.f. One well was the largest gas well ever completed in the Appalachian area.

The field is on the Chestnut Ridge anticline, and production has been developed for 14 miles along the crest and for 1½ miles NW. of the crest. Several pools on the SE. flank of the anticline have also been developed.

Productive closure above gas–water contact in the main pool is 443 ft.

Drilling and production practice are outlined. C. A. F.

168. Good pays, sure profits, lure drilling to Texas' Cambrian trend. N. S. Morrisey. *Oil Gas J.*, 12.7.54, **53** (10), 90.—Costs, completion, and drilling practice on the Cambrian trend of Coke and Nolan Counties, Texas, are described. Most of the fields produce from Strawn and Ellenburger zones, as well as the Cambrian, and are dually completed.

Reserves and ultimate recoveries are considered very high, and the fields may have active water drives.

Main drilling problems are lost circulation in Strawn and other reefs, caving shales, and occasional crooked holes. Standard materials are used to re-establish circulation, commonly Fibertex and Jelflake.

2 refs are given. C. A. F.

169. It's tough drilling on Cedar Creek anticline. J. A. Kornfeld. *Oil Gas J.*, 28.6.54, **53** (8), 117.—Drilling, coring, and logging procedures and problems in the Cedar Creek anticline area of the Williston Basin, U.S.A., are outlined.

The Cedar Creek anticline is a regional feature supporting 7 producing areas, all of which produce from pre-Mississippian beds. Production is largely controlled by local closure on the main trend. C. A. F.

170. Pembina field—one year later. F. J. Gardner. *Oil Gas J.*, 21.6.54, **53** (8), 74.—The Pembina field in west-central Alberta was discovered on a seismic anomaly in Feb. 1953. Production is from the Cardium sand, which pinches out 11½ miles to the NE. of the discovery well.

39 wells completed to date have proved a productive area of approx 28 miles by 18 miles, of which 26 are producing 121 b.d. each allowable.

The field is still in the initial stages of development, and little is known of the adjacent W. and SW. areas. No wells have yet encountered water or appreciable amounts of gas.

Recent reserve estimates have ranged from one half to 1¾ billion brl. C. A. F.

171. Neutral Zone's new oil. Wafra's drilling, development, and shipping system. Anon. *Oil Gas J.*, 28.6.54, **53** (8), 98.—The discovery and development of the Wafra field in the Kuwait–Saudi Arabia Neutral Zone are outlined.

The field is *ca* 20 miles S. of the Burgan field and 30 miles inland from the Persian Gulf. There are 7 producing wells (on a square 1-mile spacing pattern) with production ranging from 1500 to 5000 b.d/well.

The field was discovered by Wafra 4 in March 1953, and there has been continuous drilling since then. The pay is Middle Cretaceous sand *ca* 200 ft thick, equivalent to the Burgan First sand. The structure is *ca* 7 miles by 3 miles, but productive limits have not yet been determined.

Shipments commenced in Jan. 1954 after the completion of 12 miles of 8-inch and 22 miles of 10-inch pipeline to Mina Abdulla in Kuwait. C. A. F.

172. Sicily producing. Anon. *Oil Gas J.*, 19.7.54, **53** (11), 85.—2 wells have been drilled, and a third is being drilled in the Ragusa field in SE. Sicily. Crude is 19·8°, and the pay is at *ca* 6200 ft. The wells are to be pumped at *ca* 600 b.d., and crude will be shipped by tank car to Augusta for transmission to the mainland.

It is planned to have 6 wells producing in 1955, with a total annual production of 200,000 tons. C. A. F.

173. Oil behind China's bamboo curtain. Anon. *Oil Gas J.*, 14.6.54, **53** (6), 112.—There is believed to be only one producing field in China, *ca* 800 miles west of Peking. This is the Yumen field, which produces up to 4000 b.d.

Exploration is being carried out west of Yumen by a Russian–Chinese company, and it is planned to double production in this area during 1954. C. A. F.

TRANSPORT AND STORAGE

174. Mechanical engineering progress in the petroleum industry—petroleum transportation. A. H. Newberg. *Mech. Engng, N.Y.*, Aug. 1954, **76** (8), 642.—Recent developments in line and station design, and pipeline construction and operation are covered. 27 refs. T. T.

175. Organic coatings adaptable to fuel storage. J. E. Cowling *et al. Industr. Engng Chem.*, Sept. 1954, **46** (9), 1977–88.—Tests were carried out to find coatings more suitable than the polysulphide rubbers and vinyl polymers originally used to protect underground concrete fuel tanks. Test materials were applied to laboratory concrete specimens, as coatings to small concrete tanks buried in wet soil, and to pilot scale concrete tanks. They were subjected to cyclic application of 4 representative types of fuel. The adhesive properties between coat and concrete were determined with a Scott tensile testing machine. Results indicated that an entirely satisfactory lining was obtained by using a polysulphide rubber undercoating having good adhesion and extensibility, together with an inert top coating of vinylidene chloride–acrylonitrile copolymer. By dispersing a mixture of these 2 compounds in water and applying to the concrete in a high concn of 70% solids a satisfactory coating was obtained. B. A. F.

176. Cast-in-place steeled-cored concrete pipes. R. H. Sedijatmo. *Fluid Handl.*, 1954, **56**, 247.—A new stainless steel cement-covered pipeline is described which is claimed to be suitable for high heads of water, oil, or gas, and which will withstand positive and negative pressure surges. It can be cast on site without expansion joints by unskilled labour. An inner pipe of thin stainless steel is set in concrete reinforced by steel rings. The rings are held in position during construction by longitudinal bars. The installed cost is claimed to be less than that of all-steel piping. D. S.

177. Hydraulics for pipelines—Pt II. C. B. Lester. *Pipe Line News*, July 1954, **26** (7), 31–6.—Some fundamental characteristics of fluids. B. A. F.

178. Putting a products line into operation. L. B. Moon. *Pipe Line News*, Sept. 1954, **26** (9), 25–8.—A method of fabricating, testing, and bringing a pipeline into operation is described. Attention is paid to the method of thoroughly cleaning pipe used in crude oil service before changing over to refined products transportation. B. A. F.

179. Warehousing methods and procedures on a products line system. J. A. Hatfield. *Pipe Line News*, Sept. 1954, **26** (9), 29–32.—A method used in a system consisting of 43 pumping stations and terminals, 3 tank farms, and 2050 miles of trunk line is described. B. A. F.

180. Patent. Ger.P. 918,498, 19.8.54. — Pechstein, assr to Fa. Klönne, Dortmund. Container for storing oil or easily vaporizing liq.
BrennstChemie, 1954, **35** (17–18). R. T.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

181. Mechanical engineering progress in the petroleum industry—petroleum refining. J. S. Rearick. *Mech. Engng, N.Y.*, Aug. 1954, **76** (8), 646.—Recent advances in cat reforming and cracking, continuous coking, desulphurization, combination processing, process control, and maintenance organization are discussed. 32 refs. T. T.

182. Process handbook. Anon. *Petrol. Refin.*, 1954, **33** (9), 111–278.—A collection of 69 flow descriptions and diagrams for the most important licensed processes, grouped under the headings: cat cracking and reforming, thermal conversion, gas conversion, light hydrocarbon recovery, oil dist processes, solvent refining, and treating. Each is described in terms of its application, charge, products, operating conditions, yields, and commercial installations. R. D. S.

183. Special refinery equipment for tropical and sub-tropical areas. E. Le Q. Herbert. *Fluid Handl.*, 1954, **56**, 245.—Added precautions must be taken to reduce corrosion of plant in tropical areas. All materials stored in the open need protection, and the insulation of electrical equipment must be non-hygroscopic or specially impregnated. Special measures must be taken to reduce evaporation losses. In general, the reliability of all equipment must be proved before installation in tropical areas. D. S.

184. Chemical engineering fundamentals. *Industr. Engng Chem.*, May 1954, **46** (5), 877–952.—The second annual review of research covering fundamental papers on thermodynamics, chemical rate processes, fluid dynamics, mass and heat transfer, and the literature on colloidal and surface phenomenon, computers, statistics, and mathematics. B. A. F.

185. Heat transfer in packed beds: prediction of radial rates in gas–solid beds. W. B. Argo and J. M. Smith. *Chem. Engng Progr.*, Aug. 1953, **49** (8), 443–51.—A method is presented for the prediction of the effective thermal conductivity of a packed-bed heat exchanger by summing the contributions of each mechanism by which heat is transferred radially in the bed, and applications of the method are indicated. The equation developed includes the effects of void space, temp level, mass velocity, particle size, thermal conductivity of the solid packing, and physical properties of the gas upon the effective thermal conductivity. Results so obtained show good agreement with experimental data where conductivity applies to the bed itself, while overall effective thermal conductivities include the effect of a wall resistance, and are accordingly lower than those applicable for the computation of temp profiles within the bed. J. G. H.

186. What determines which heat exchanger is your best buy? E. D. Anderson and E. W. Flaxbart. *Oil Gas J.*, 25.10.54, **53** (25), 100.—Comparative construction and capabilities of basic heat-exchanger types are analysed and cost graphs given for various kinds and sizes of exchanger. G. A. C.

187. Optimal working conditions of packed rectifying columns. K. Szadkowski. *Nafta (Krakow)*, 1953, **9**, 273–5, 297–300.—Using binary mixtures of C_6H_6 with either dichloroethane or carbon-tetrachloride, rectification has been carried out in an adiabatic column 1100 mm long, 28·4 mm I.D. filled with Raschig rings. The kettle—2 l R.B. flask—was heated electrically. Experiment was carried out with total and partial return of bottoms (residues) to the kettle. First of all it has been established that Raschig rings are quite adequate for their job. Condition, which was then varied, was the rate of evaporation. Variation of liq retention in column then followed automatically.

Best rectification was obtained when the whole length of the column filled with Raschig rings was full of emulsified liq. Very extensive observations were made of behaviour of the liq phase inside the column. As the evaporation rate rises, frothing appears and later occupies more of the column. At 42 cm³/minute ¼ of its length filled with emulsified liq and number of equivalent theoretical plates rose by 24%. On repacking (emptying the column and refilling with the same

rings), number of E.T.P. rose by 68% when evap rate reached over 37 cm³/minute, and another change in the packing arrangement more than doubled the E.T.P. number at 36 cm³/minute. At such critical point (which is preceded by a fall in number of E.T.P.) the pressure differential between top and bottom leaps fourfold, and time of retention of liq in the column rises fivefold. There appears to be an equilibrated mode of operation when the column is full of froth and number of E.T.P. is nearly 2·5 times higher than without frothing. In industrial design some consideration must be given to offtakes at various heights. M. S.

188. Sludge return for control of scale formation. W. A. Parsons and H. Henkelekian. *Industr. Engng Chem.*, July 1954, **46** (7), 1503–7.—Deposits of calcium sulphate may form in pipes and treatment units after neutralization of acid wastes with lime. Evidence is presented that scaling can be controlled by seeding the neutralized waste with return sludge or gypsum crystals. B. A. F.

189. Pipeline design for non-Newtonian fluids. A. B. Metzner. *Chem. Engng Progr.*, Jan. 1954, **50** (1), 27–34.—A method is presented for the prediction of pipeline pressure-drop requirements for the laminar flow of non-Newtonian fluids using only lab visc data and pressure measurements at various velocities in a pipeline of convenient size. The possibilities of the method are indicated and illustrated by correlation of data on 5 plastic and pseudo-plastic fluids under stated conditions. J. G. H.

190. Residual fuel problem in Italy. F. Bertolini. *Riv. Combust.*, 1954, **8** (3), 184–93.—The average yields of residual fuel from Italian refineries is 46·5% of the crude run to stills. This fact, jointly with the present overproduction of the whole refining industry of Italy, caused a heavy surplus of residual fuel. Technical, economic, and political factors involved in the present difficult situation, and possible solutions to the problem of residual fuel surplus are discussed in detail. (Author's abstract.)

191. Patent. Ger.P. 920,065, 30.9.54. — Fütterer, — Göggel, and — Heinzel, assrs to BASF AG, Ludwigshafen. Process for rotating gases or liq in pressure reactions. *BrennstChemie*, 1954, **35** (19–20). R. T.

DISTILLATION

192. Investigation of pressure drop through a bubble-cap plate. J. E. Cauley, G. Z. Moore, and M. van Winkle. *Chem. Engng Progr.*, Oct. 1953, **49** (10), 553–9.—The effect of skirt clearance, weir height, vapour velocity, and liq rate on pressure drop was studied in one of a series of investigations of the variables encountered in the design and operation of bubble-cap fractionating columns. The equipment and procedure employed are described in detail, and it is emphasized that data so developed are only applicable to a bubble-cap plate similar to the one used in the investigation. In the present investigation pressure drop was determined as a function of weir height and of skirt clearance. J. G. H.

193. Pulse columns. R. Stephenson. *Chem. Engng Progr.*, July 1953, **49** (7), 340.—Details of constructional and physical aspects of pulse columns are briefly presented, together with operational features. J. G. H.

194. Performance of pulse extraction columns. R. M. Cohen and G. H. Beyer. *Chem. Engng Progr.*, June 1953, **49** (6), 279–86.—Recent developments in equipment for continuous liq–liq extraction processes include the construction of columns with fixed plates in which agitation of the liq is effected by means of cyclic pulsations imparted thereto by external mechanical means. The construction and operation of such a column is described and illustrated, and performance data presented indicates the effect of flow rates, pulse amplitude, and frequency and the effect of continuous phase using a soln of *iso*amyl alcohol–boric acid. J. G. H.

195. Combination batch and continuous fractionation column. S. T. Kiguchi. *Industr. Engng Chem.*, July 1954, **46** (2), 1363–70.—A description of the design and operation of the column. For batch dist, the unit has a capacity of 5–17 gal and can accommodate feed rates of 0·5–10 gal/hr when operated continuously. The column can be operated at pressures from 5 mm mercury absolute pressure to 600 p.s.i. and at temp up to 750° F. Uniform and predictable column performance is achieved by a high degree of instrumentation. Results of a few tests show the effect of operating variables on column performance and the difference between batch and continuous operation. B. A. F.

196. Liquid–liquid extraction at high flow rates in a spray tower. J. F. Fleming and H. F. Johnson. *Chem. Engng Progr.*, Sept. 1953, **49** (9), 497–502.—Details are presented of an investigation of extraction performance of a spray tower over a wide range of flow rates and of limiting flow in the spray tower, both with and without extraction taking place, using a methyl *iso*butyl ketone–acetic acid–water system. The apparatus and procedure employed are described, and it is pointed out that as flow conditions at limiting flow are the same when a solute is present and extraction is taking place as when no solute is present, simple limiting flow studies can be used to predict conditions for optimum extraction. Results obtained are shown to be in close agreement with qualitative observations reported by other workers. J. G. H.

197. Effect of packing size and column diameter on mass transfer in liquid–liquid extraction. I. Leibson and R. B. Beckman. *Chem. Engng Progr.*, Aug. 1953, **49** (8), 405–16.—Details are presented of an investigation of the effect of packing size and column dia on mass transfer in countercurrent liq–liq extraction, utilizing non-porous unglazed porcelain Raschig rings of size from ¼ to 1 inch and 3 extraction columns of 3, 4, and 6 inches in dia for the mass transfer of diethylamine from a continuous water phase to a dispersed toluene phase. The equipment employed is described in detail, and the photographic technique used revealed that droplet size of the dispersed phase is independent of packing type and size for packings of ½ inch or larger and is greater for ¼-inch rings than for any of the larger sizes of packing. Results obtained allow for an explanation to be presented of the mass transfer results in terms of changes in interfacial control area due to effect of packing size on dispersed phase droplet size and in the hold-up of the dispersed phase. A correlation is developed of the effect of packing size on the individual film height of a transfer unit for packing sizes of ½ inch or larger. J. G. H.

ABSORPTION AND ADSORPTION

198. Patents. Ger.P. 918,403, 19.8.54. — Jahnentz, assr to Chem. Werke Hüls AG, Marl (Kr Recklinghausen). Process for light oil recovery from cracked gases.

Ger.P. 918,765, 26.8.54. — Siebert, assr to Metallges. AG, Frankfurt. Process for recovering pure hydrocarbons or their pure mixtures from gases. *BrennstChemie*, 1954, **35** (17–18).

Ger.P. 919,767, 23.9.54. — Arndt, assr to Koppers G.m.b.H., Essen. Saturator for $(NH_4)_2SO_4$ production.

Ger.P. 919,887, 30.9.54. — Kretzschmann, assr to Deutsches Hydrierwerk Rodleben VEB, Rodleben bei Rosslau. Process for higher-mol alcohol recovery from hydrocarbon mixtures.

Ger.P. 919,888, 30.9.54. — Büchner, — Hagemann, — Schnur, — Sinner, and — Schwarz, assrs to Ruhrchemie AG, Oberhausen. Process for recovering O_2-containing compounds from their mixtures with hydrocarbons. *BrennstChemie*, 1954, **35** (19–26). R. T.

SOLVENT EXTRACTION AND DEWAXING

199. Characteristics of a Podbielniak centrifugal extractor. N. Barson and G. H. Beyer. *Chem. Engng Progr.*, May 1953, **49** (5), 243–52.—The application of centrifugal force to liq–liq extraction as exemplified in the operation of the Podbielniak centrifugal extractor is outlined and the apparatus used, an 18-inch dia rotor spinning at 5000 r.p.m. and containing 18 concentric cyl at 180° intervals, is described. In the system light liq introduced at the periphery of the rotor is displaced inward by heavy liq flowing from the axes, in which manner both phases formed a new interfacial area at which extraction could take place, the centrifugal force field markedly speeding up phase operation. Details are presented of runs using the system boric acid–*iso*amyl alcohol–water. J. G. H.

200. Calculation of leaching operations : equilibrium and non-equilibrium conditions. E. G. Scheibel. *Chem. Engng Progr.*, July 1953, **49** (7), 354–8.—Leaching is described as a special case of solvent extraction where material is extracted by means of a suitable solvent from a solid. A concept of free soln and of the soln adhering to the solid as 2 separate phases is developed in order to indicate the relationship between liq–solid extraction and such other types of diffusional operations as absorption, dist, and liq–liq extraction. In those cases where the amount of adhering soln is constant, present concept allows for the use of well-known and generally available charts for estimating operating conditions. For those cases where the liq adhering to the solid varies appreciably with solute concn, a simple graphical method, based on a def of fractional efficiency analogous to the Murphree efficiency in dist, is presented for the calculation of equilibrium stages in leaching operations. J. G. H.

201. Studies in solvent extraction from bituminous coal. Pt I. Sulcis coal. V. Berti, C. Siniramed, and C. Marci. *Riv. Combust.*, 1954, **8** (9), 639–67.—Solvent extraction of Sulcis, Sardinia, bituminous coal has been studied. Several runs have been carried on by Soxhlet extraction apparatus, at the boiling temp of the solvent, with different organic compounds (tetrahydrofuran, pyridine, morpholine, benzylamine, ethylene-diamine, and others). The highest extraction yields have been obtained by amine solvents, in particular by ethylene-diamine and monoethanolamine. Elemental composition of various extracts and residua has been determined and the distribution of main components (C, H, S, N, O, and ashes) has been correlated with extraction conditions and type of solvent employed. Some of the more significant extracts have been further fractionated by solvent extraction and by chromatography, with the aim of obtaining simpler compounds whose structure could be more easily interpreted. (Authors' abstract.)

202. Patents. Ger.P. 917,864, 5.8.54. — Willig and — Stock, assrs to Esso AG, Hamburg. Process for centrifugally dewaxing lub oils.

Ger.P. 917,865, 5.8.54. Edeleanu-Ges.m.b.H., Frankfurt (M.), and Deutsche Erdöl AG, Hamburg. Process for dewaxing petroleum oils and tars and their dist.

Ger.P. 918,651, 19.8.54. — Hoppe, assr to Edeleanu-Ges. m.b.H., Frankfurt (M.), and Deutsche Erdöl AG, Hamburg. Process for dewaxing mineral and tar oils. (Addn to Pat. 917,865.)

Ger.P. 918,530, 19.8.54. — Krebs, assr to Gottfried Bischoff G.m.b.H., Essen. Process for scrubbing naphthalene from gases.
BrennstChemie, 1954, **35** (17–18).

Ger.P. 919,311, 9.9.54. — Rottig, assr to Ruhrchemie AG, Oberhausen. Process for separating high-m.p. paraffins from mixtures of hydrocarbons and hydrocarbon compounds.

Ger.P. 919,597, 16.9.54. — Schäfer, Dortmund. 2-stage process for selectively scrubbing H_2S from gases containing NH_3 and CO_2, *e.g.* dist gases.

Ger.P. 920,078, 30.9.54. — Herbert, assr to Metallges. AG, Frankfurt (M.). Method and plant for processing tars, coal extracts, hydrogenation products, etc., with selective solvents.
BrennstChemie, 1954, **35** (19–20). R. T.

CRACKING

203. Small scale fluid catalytic cracking unit. T. Rice *et al.* *Industr. Engng Chem.*, Aug. 1954, **46** (8), 1558–61.—Operating data for full scale plant of capacities ranging from 20,000 to 60,000 b.d. is obtained from a small scale unit with an oil feed rate of 400–1400 g/hr and a total cat wt of 1700–3000 g. Data obtained were in good agreement with pilot scale plant having a 2-b.d. feed rate. B. A. F.

204. Thermofor pyrolytic cracking process. T. F. Loughry. *Riv. Combust.*, 1954, **8** (7–8), 491–512.—A report on the successful development, on pilot plant scale, of the new continuous Thermofor pyrolytic cracking for producing 950–1050 B.T.U/cu. ft. fuel gas from reduced crude and other heavy residua. Such a gas is completely interchangeable with natural gas, and will be of great interest to the gas industry all over the world. (Author's abstract.)

205. Catalytic dehydrogenation of naphthenes by sulphur dioxide. J. D. Danforth and M. J. Bender. *Industr. Engng Chem.*, Aug. 1954, **46** (8), 1701–3.—Activated carbon was found to be a suitable cat for dehydrogenation at 500° C and atmospheric pressure of *cyclo*hexane, methyl and ethyl *cyclo*hexane, and decolin in the presence of sulphur dioxide. B. A. F.

206. SO_2 extraction process for aromatics recovery. W. F. Wilkinson, J. R. Ghublikian, and P. Obergfell. *Chem. Engng Progr.*, May 1953, **49** (5), 257–62.—The conventional process for the separation of aromatics from petroleum dist is described with flow sheet, treating conditions, utilities requirements, and investment and operating costs. Equivalent details are presented for a modified SO_2 process in which the extract obtained by the process just mentioned is further enriched by contacting it with a hydrocarbon fraction of essentially paraffinic character and of a boiling range different from that of the charge oil. J. G. H.

207. Improved butane dehydrogenation catalysts. E. W. Pitzer *et al.* *Industr. Engng Chem.*, July 1954, **46** (7), 1541–4. Investigations were made into the effect on cat activity of new or modified methods of preparation and of cat composition. Digestion in ammonium nitrate and digestion in nitric acid appeared more promising methods of preparation than thermal decomposition of metal compounds or the impregnation of activated alumina pills, etc. B. A. F.

208. Pyrolytic and catalytic decomposition of hydrocarbons. M. J. Sterbo and V. Haensel. *Industr. Engng Chem.*, Sept. 1954, **46** (9), 1888–94.—A review of publications for the year ending May 1954, covering thermal cracking, cat cracking, and cat reforming. B. A. F.

209. Patents. Ger.P. 916,886, 8.7.54. — Dorschner and — Wenzel, assrs to Metallges. AG, Frankfurt (M.). Exothermic cat reaction process. (Addn to Pat. 872,938.)

Ger.P. 916,660, 8.7.54. — Michael, assr to BASF AG, Ludwigshafen (Rhein). Process for cat cracking hydrocarbons. (Addn to Pat. 849,157.)

Ger.P. 917,026, 15.7.54. — Rottig, assr to Ruhrchemie AG, Oberhausen. Process for hydrocarbon aromatization and dehydrogenation.
BrennstChemie, 1954, **35** (15–16).

Ger.P. 919,127, 2.9.54. — Kolling and — Tramm, assrs to Ruhrchemie AG, Oberhausen. Process for dehydrogenating aromatization of saturated hydrocarbons.

Ger.P. 919,227, 9.9.54. — Wiedmann, assr to Rheinpreussen AG für Bergbau und Chemie, Homberg. Method for ZnO cat production for *sec*-alcohol and ketone dehydrogenation.

Ger.P. 919,837, 23.9.54. — Jahnentz and — Reich, assrs to Chem. Werke Hüls AG, Marl. Process for light oil recovery from cracked gases.

Ger.P. 920,066, 30.9.54. — Klemm, assr to BASF AG, Ludwigshafen. Method for cat production.

BrennstChemie, 1954, **35** (19–20). R. T.

HYDROGENATION

210. Patents. Ger.P. 918,767, 26.8.54. — Bär, assr to BASF AG, Ludwigshafen (Rhein). Method for processing residues of pressure hydrogenation of coals, tars, and mineral oils. (Addn to Pat. 867,088.)

BrennstChemie, 1954, **35** (17–18).

Ger.P. 919,288, 9.9.54. — Gross, — Rottig, — Royen, and — Schenk, assrs to Ruhrchemie AG, Oberhausen. Method for producing Fe cat suitable for cat CO hydrogenation under especially high gas load.

Ger.P. 919,289, 9.9.54. — Rottig, assr to Ruhrchemie AG, Oberhausen. Process for cat CO hydrogenation using Fe cat ppted from H_2SO_4 soln.

BrennstChemie, 1954, **35** (19–20). R. T.

CHEMICAL AND PHYSICAL REFINING

211. Sulphuric acid regeneration of high capacity cation exchanger. J. H. Kay *et al.* *Industr. Engng Chem.*, May 1954, **46** (5), 862–6.—The exhaustant composition, acid concn, and leakage of cations determine the regenerative method used. With exhausted ion exchange resins containing a high proportion of calcium ions, step-wise addition of acid of increasing concn give good acid utilization and an increase in capacity of 40% over dilute acid methods. B. A. F.

212. Hydrodesulphurization of gasolines over vanadium oxide. V. I. Komarewsky *et al.* *Industr. Engng Chem.*, Aug. 1954, **46** (8), 168–95.—The cat hydrogenalysis of sulphur compounds in gasoline was studied at 400° C, and an hourly space velocity of 0·25 max desulphurization was achieved at 400 p.s.i.g. for both straight-run and thermally cracked gasolines, the reduction in sulphur content being between 95 and 98%. Hydrogenation of olefins also took place, giving marked reduction in octane rating. 90% desulphurization was obtained at 480° C with an hourly space velocity of 0·8 and a pressure of 200 p.s.i.g. without altering octane rating. B. A. F.

213. Patents. Ger.P. 916,826, 8.7.54. Bergwerksverband zur Verwertung von Schutzrechten der Kohlentech. G.m.b.H., Dortmund. Processing of NH_3-aq containing H_2S. (Addn to Pat. 874,000.)

Ger.P. 916,827, 8.7.54. — Grosskinsky and — Umbach, assrs to Bergwerkoverband zur Verwertung von Schutzrechten der Kohlentech. G.m.b.H., Dortmund. Extension of method for processing NH_3-aq containing H_2S. (Addn to Pat. 874,000.)

Ger.P. 917,246, 22.7.54. — Kröger, assr to Kröger, Essen, and Harpener Bergbau AG, Dortmund. Method for benzene first runnings preparation.

BrennstChemie, 1954, **35** (15–16).

Ger.P. 918,566, 19.8.54. — Büchner, assr to Ruhrchemie AG, Oberhausen (Rhld.). Process for regenerating cat soln containing $CoSO_4$.

BrennstChemie, 1954, **35** (17–18).

Ger.P. 919,045, 2.9.54. — Büchner, assr to Ruhrchemie AG, Oberhausen. Process for recovering caustic alkali needed for neutralization and ester saponification in CO hydrogenation products.

Ger.P. 919,598, 16.9.54. — Bayerlein, — Schade, and — Springer, assrs to F. J. Collin AG zur Verwertung von Brennstoffen und Metallen, Dortmund. Process for de-acidifying ammoniacal wash waters enriched with H_2S and CO_2.

Ger.P. 919,734, 23.9.54. — Herbert, — Rüping, — Hubmann, and — Danulat, assrs to Metallges. AG, Frankfurt (M.). Process for separating S compounds from combustible gases.

BrennstChemie, 1954, **35** (19–20). R. T.

SPECIAL PROCESSES

214. How ethylbenzene is made. F. R. Garner and R. L. Iverson. *Oil Gas J.*, 25.10.54, **53** (25), 86.—The production by the Koppers Co at its Kobuta, Pa, plant of ethylbenzene by the high pressure alkylation process is described, together with its manufacture at its Williams plant at North Arthus, Tennessee, by the aluminium chloride process. G. A. C.

215. Partial oxidation with air. B. J. Mayland, E. M. Comley, and J. C. Reynolds. *Oil Gas J.*, 25.10.54, **53** (25), 94.—The relative costs and potential advantages of a process for production of ammonia synthesis gas by partial oxidn with air are discussed, for use where by-product hydrogen is available from a cat reformer, ethylene unit, or other source. G. A. C.

216. Sulphonation and sulphation. E. E. Gilbert and E. P. Jones. *Industr. Engng Chem.*, Sept. 1954, **46** (9), 1903.—In a general review of the publications in 1953, one section covers treatment of petroleum fractions, including acid treatment of shale oil and patents for the production of lubricant additives. B. A. F.

217. Continuous analyses via infra-red. P. A. Wilks. *Oil Gas J.*, 25.10.54, **53** (25), 91.—The production is described of improved ethylene by monitoring with continuous infra-red analysis. The non-dispersive infra-red analyser is described, together with operating principle and use of the analyser to warn of hazardous conditions. G. A. C.

218. Patents. U.S.P. 2,683,076 (20.11.52; 6.7.54). H. E. Cier and H. G. Schutze, assrs to Standard Oil Development Co. Hydrocarbons are reacted with SO_2 and Cl_2 to produce a hydrocarbon sulphonyl chloride (I), the reaction product mixed with water and I separated from the aq soln (II). The gaseous mixture of SO_2, Cl_2, and HCl evolved during the reaction is scrubbed with II to remove the HCl and then returned to the reaction zone.

U.S.P. 2,683,078 (26.4.50; 6.7.54). R. S. Pratt, assr to M. W. Kellogg Co. Hydrazine is made by reacting activated methane, ethane, metal substituted methane or ethane, ethylene oxide, or propylene oxide with nitric oxide or nitrogen trioxide at −20° to 122·5° C to produce a dimer of a nitrosoalkane, and hydrogenating the dimer at 0°–122·5° C and a pressure of 1000–5000 p.s.i. to produce a mixture of hydrazine and an alkane.

U.S.P. 2,683,121 (28.11.51; 6.7.54). G. H. Vincent, assr to M. W. Kellogg Co. Preparation of hydrocarbon synthesis gas from gaseous hydrocarbons.

U.S.P. 2,683,122 (G.B. 10.3.50; 6.7.54). C. A. Woodcock, D. J. Hadley, and D. J. H. Jacobs, assrs to Distillers Co. Oxidn cat comprising oxides of phosphorus and molybdenum are regenerated by soaking in water or aq ammonia and drying.

U.S.P. 2,683,123 (24.11.50; 6.7.54). C. C. Schwegler, F. M. Tennant, and F. J. Soderquist, assrs to Dow Chemical Co. Dehydrogenation cat are prepared by mixing potassium carbonate, an alkali metal dichromate, and ferric oxide with

6–25% of their wt of carbon black and enough refractory cement and water to make a thick extrudable paste, extruding the paste, dehydrating, and heating in steam to 500°–650° C to remove carbon and activate the cat.

U.S.P. 2,683,152 (28.11.51; 6.7.54). N. L. Dickinson, assr to M. W. Kellogg Co. Preparation of hydrocarbon synthesis gas from normally gaseous hydrocarbons.

U.S.P. 2,683,158 (21.5.49; 6.7.54). J. W. Brown and H. E. W. Burnside, assrs to Standard Oil Development Co. Fischer–Tropsch process using a fluidized cat.

U.S.P. 2,683,159 (23.6.51; 6.7.54). M. L. Rambo, assr to Texas Co. Wax formation on the cat in the Fischer–Tropsch process is inhibited by preconditioning the cat with synthesis gas and then using a hydrogen lean synthesis gas with added water vapour.

U.S.P. 2,683,174 (9.9.49; 6.7.54). A. J. de Rosset, assr to Universal Oil Products Co. *iso*Butylene is reacted with oxygen at 180°–300° C and a pressure of 30–150 atm for 0·5–60 sec to produce aldehydes, ketones, and alcohols.

U.S.P. 2,683,177 (29.10.49; 6.7.54). E. Field, assr to Standard Oil Co. The OXO process is carried out in the presence of a cobalt carbinolation cat and sulphur or an inorganic sulphur compound at 150°–200° C and a pressure of 50–300 atm and at a velocity < 10 mol olefin/gram atm of cobalt/hr. Alcohols are produced directly.

U.S.P. 2,683,653 (26.2.51; 13.7.54). S. P. Robinson, assr to Phillips Petroleum Co. Apparatus for dehydrogenating hydrocarbons.

U.S.P. 2,683,657 (29.5.48; 13.7.54). P. W. Garbo, assr to Hydrocarbon Research Inc. Gasification of solid carbonaceous material using fluidized solids technique.

U.S.P. 2,683,688 (Germany 6.3.50; 13.7.54). H. Tramm, N. Geiser, and S. Puschhof, assrs to Ruhrchemie Akt. Alkyl monochlorides are made by passing a saturated liq hydrocarbon and chlorine down a narrow zone containing filler material and continuously illuminating the reactants along the path of flow.

U.S.P. 2,683,726 (25.1.49; 13.7.54). H. G. McGrath and L. C. Rubin, assrs to M. W. Kellogg Co. Hydrocarbons are synthesized from hydrogen and a carbon oxide using as cat a finely divided reduced magnetite containing minor proportions of alumina, silica, and titania.

U.S.P. 2,683,731–2 (5.3.52, 29.5.52; 13.7.54). J. S. Atwood, assrs to National Petro-Chemicals Corpn. Methods of absorbing ethylene in sulphuric acid to form a mixture of monoethyl and diethyl sulphates.

U.S.P. 2,683,753 (G.B. 16.8.46; 13.7.54). N. Levy and R. K. Greenhalgh, assrs to I.C.I. Ltd. *iso*Propanol is made by reacting water and propylene at 250°–290° C and a pressure of 100–500 atm in the presence of blue oxide of tungsten.

U.S.P. 2,684,895 (7.10.48; 27.7.54). B. J. Mayland, assr to Phillips Petroleum Co. Synthesis gas manufacture from natural gas using pebble heating.

U.S.P. 2,684,896 (10.10.50; 27.7.54). C. A. Coghlan, assr to Texas Co. Synthesis gas is produced by partially burning liq hydrocarbons at 1800°–3000° F in a reaction zone, so that more than 2% of the carbon present in the hydrocarbons is liberated as free carbon, separating the carbon from the hydrogen and carbon monoxide, and burning the carbon in a combustion zone in indirect heat exchange with the reaction zone.

U.S.P. 2,684,951 (11.10.50; 27.7.54). H. O. Mottern, assr to Standard Oil Development Co. Dehydrogenation cat comprising a group II metal oxide coated on lumps of fused zirconia.

U.S.P. 2,684,967 (19.3.53; 27.7.54). C. H. O. Berg, assr to Union Oil Co of California. Production of ethylene or propylene oxide from ethylene or propylene and oxygen.

U.S.P. 2,684,975 (30.12.50; 27.7.54). C. G. Frye, assr to Stanolind Oil and Gas Co. In the Fischer–Tropsch process CO_2 is injected into the reaction zone at least $\frac{1}{4}$ of the way up the cat bed.

U.S.P. 2,684,984 (31.3.52; 27.7.54). H de V. Finch and K. E. Furman, assrs to Shell Development Co. *cyclo*Paraffins are contacted with oxygen at 100°–180° C in the presence of a monobasic aliphatic carboxylic acid of 1–6 carbon atoms to produce cyclic alcohols and ketones.

U.S.P. 2,684,986 (23.12.49; 27.7.54). R. N. Watts, R. W. Krebs, and S. C. Lane, assrs to Standard Oil Development Co. In the OXO process the cat is injected into the reaction zone as a paste.

U.S.P. 2,684,987 (19.11.51; 27.7.54). R. M. Mantell, H. J. Passino, and W. O. Teeters, assrs to M. W. Kellogg Co. Halocarbons are prepared from carbon, fluorine, and another halogen. J. M. S.

Ger.P. 916,947, 15.7.54. — Canzler and — Krekeler, assrs to BASF AG, Ludwigshafen (Rhein). Method for paraffin–olefin mixture production. (Addn to Pat. 764,594.)

Ger.P. 917,006, 15.7.54. — Ziegler and — Gellert, assrs to Ziegler, Mülheim. Method for producing org compounds of Al and Be.
BrennstChemie, 1954, **35** (15–16).

Ger.P. 919,951, 30.9.54. — Wenzel, assr to BASF AG, Ludwigshafen. Process for converting CO with H_2.

Ger.P. 920,071, 30.9.54. — Ziegler, — Gellert, and — Martin, assrs to Ziegler, Mülheim. Method for producing org compounds of Al.

Ger.P. 919,226, 9.9.54. — Gemassmer and — Berg, assrs to Chem. Verwertungsges. Oberhausen m.b.H., Oberhausen. Method for producing O_2-containing compounds.
BrennstChemie, 1954, **35** (19–20). R. T.

METERING AND CONTROL

219. Pulsation exploration—how it affects gas measurements. E. C. Lindahl. *Pipe Line News*, Sept. 1954, **26** (9), 33–6.—Pulsation flow may cause seriously erroneous instrument readings. Any device producing a pressure drop between source of pulsation and meter tends to minimize the error. The inclusion of volume tanks is the most usual method of damping pulsations. Further research on the subject is required. B. A. F.

220. Patent. U.S.P. 2,683,656 (17.10.49; 13.7.54). B. J. Mayland, assr to Phillips Petroleum Co. Apparatus for controlling the partial combustion of methane to synthesis gas. J. M. S

PRODUCTS

CHEMISTRY AND PHYSICS

221. Spontaneous ignition of an inflammable gaseous mixture on release from compression. W. C. F. Shepherd. *Nature, Lond.*, 1954, **174**, 658.—The article commences with a résumé of earlier work of Payman and Shepherd showing that: (*a*) ignition by shock wave is not associated with any frictional or mechanical effect arising during the rupture of the diaphragm initiating the shock; (*b*) spread of flame through methane–air mixtures is prevented by an air gap interposed in the column of inflammable mixture by the dissolution of a vortex ring of air from the compression chamber.

When the compression chamber contained not air but a mixture of methane with O_2, explosion was obtained both when the expansion chamber contained methane–air mixture and when it contained air only. In the latter experiments the bursting pressure which produced the explosion: (i) was lowered when the methane percentage of the mixture in the compression chamber increased; (ii) was raised when the expansion chamber was shortened. With a mixture containing 22·3% methane, ignition was obtained following release into free air at a bursting pressure of 1000 p.s.i. There is no perceptible delay before ignition.

It is possible that ignition arises as a result of heat transfer from the air compressed and heated in the shock wave to the contiguous layers of explosive mixture that form the driver piston. H. C. E.

222. Phase equilibria in the carbon dioxide–methane system. H. G. Donnelly and D. L. Katz. *Industr. Engng Chem.*, March 1954, **46** (3), 511–17.—Data given on the critical locus, and the divariant liq–vapour equilibria to 100° F. Investigations also covered a considerable portion of the 3-phase locus in which solid CO_2 is in existence with the liq and vapour phases. A large portion of the liq surface in which soln were saturated with solid CO_2 was investigated. B. A. F.

223. Vapour–liquid equilibria of naphthalene-1-octadecene system at sub-atmospheric pressures. W. L. Martin and M. van Winkle. *Industr. Engng Chem.*, July 1954, **46** (7), 1477–81.—Data obtained at 7 pressures ranging from 760 to 10 mm mercury. B. A. F.

224. Cooling liquids with finned coils. D. L. Katz, E. H. Young, R. B. Williams, and G. Balekjian. *Petrol. Refin.*, 1954, **33** (9), 303–6.—Graphical correlations are presented for the prediction of heat transfer and pressure drop for air flow over banks of finned tubes. R. D. S.

225. Displacement of petroleum from sand surfaces by solutions of polyoxymethylated detergents. H. N. Dunning *et al. Industr. Engng Chem.*, March 1954, **46** (3), 591–6.—Aq soln of 4 series of polyoxymethylated alkyl phenol type detergents were tested for the efficiency with which they displaced crude oil from a synthetic sand, the displacement being accomplished by centrifuging. The displacement efficiency could be correlated with the more common detergent properties of surface activity, emulsifying capacity, and hydrophilic–lipophilic balance. A high level of efficiency was maintained as the polyoxyethylene chain was extended, an effect that may have been due to the hydrophilic nature of the sand. The most efficient detergents displaced 1·2–1·3 times the amount of oil displaced by dist water from the sand which represented 80–90% of the oil present. A high efficiency was maintained at an ethylene oxide mol ratio high enough to ensure solubility at reservoir temp. B. A. F.

226. Pyrolysis of C_3 and C_4 hydrocarbons. R. E. Kinney and D. J. Crowley. *Industr. Engng Chem.*, Feb. 1954, **46** (2), 258–64.—Pyrolysis of pure C_3 and C_4 hydrocarbons and mixtures representative of refinery gases was carried out at 1500° F, with contact times ranging from 0·2 to 80 sec. Experiments were also carried out to find the effect of temp on yields. The results could be explained best on the basis of a free radical mechanism. B. A. F.

227. Liquid-state equation for normal paraffins. A. K. Doolittle. *Nature, Lond.*, 1954, **174**, 369.—The following equation has been deduced from liq densities and heats of vaporization of *n*-paraffin hydrocarbons:

$$\frac{\rho - \rho_c}{\rho_0 - \rho_c} = \left[\frac{(1 + \alpha T)(-E/V)}{(-E/V)_0}\right]^{\frac{1}{2}}$$

where ρ and ρ_0 are the densities at $T°$ C and at absolute zero, ρ_c is the critical density, $(-E/V)$ and $(-E/V)_0$ are the cohesive-energy densities of the liq at $T°$ C and at absolute zero, and α is a constant ($=0{\cdot}00125$).

This equation has been tested over the range $-190 < T < 345°$ C for the mol. wt. range 44–283. H. C. E.

228. Corrected Guldberg rule. S. T. Bowden. *Nature, Lond.*, 1954, **174**, 613.—Deviations from the Guldberg rule arise from liq having different cohesive forces which are related to surface tension γ. It is found that $T_b\gamma_b^{\frac{1}{4}}/T_c = 4/3$, where T_b and T_c are the b.p. and critical temp in °K of the liq.

Since the molar vol of a liq at its b.p. is $\frac{3}{8}$ of its critical vol, $T_b\gamma_b^{\frac{1}{4}}V_b/T_cV_c = \frac{1}{2}$, and the parachor P is given by $P = V_cT_c/2T_b$. Examination of published data reveals that this expression is in general more accurate than other similar formulæ. H. C. E.

229. Activation of carbons. W. K. Lewis and A. B. Metzner. *Industr. Engng Chem.*, May 1954, **46** (5), 849–58.—Exposure of birch charcoal to sulphur vapour at 500° C resulted in the selective dehydrogenation of the carbonaceous material with little loss of carbon as the disulphide. Exposure of the carbon–sulphur complex to hydrogen at 850° C produced a strong, highly absorptive product with a very fine pore structure. The products having max absorptive capacity were produced at an average yield of 66%. Industrial uses for the product include solvent recovery, the hypersorption process, and probably the separation of straight-chain from branched-chain hydrocarbons of virtually identical b.p. Charcoal activation by inert gases has the advantage of high product yield and low cost, although the resulting product was inferior to that produced by sulphur–hydrogen activation. B. A. F.

ANALYSIS AND TESTING

230. Estimation of nitrogen combined with oxygen in coal oxidation products. G. Beck. *BrennstChemie*, 1954, **35** (13–14), 212–13.—The estimation of N_2 in N–O groups in coal oxidn products is carried out by reduction with zinc amalgam in HCl soln, and subsequent titration with $NaNO_2$ to complete diazotation. The difference between total N_2 and this val may be considered to represent *heterocyclic* combination. R. T.

231. Process instrumentation. Various. *Industr. Engng Chem.*, July 1954, **46** (7), 1371–435.—16 papers are presented, amongst which 8 deal with infra-red analysers and 2 with mass spectrometers.

Karasek and Miller (p. 1374) describe an infra-red analyser sensitized to the 2·7-μ band of water in liq SO_2 for use in a refinery SO_2 gas oil extraction unit. The instrument has a full scale span of 0·4 wt % and an accuracy of $\pm 0{\cdot}01\%$. Hollander *et al* (p. 1377) deal with the application of an infra-red non-dispersion analyser to refinery process streams, and a specific example involving the measurement of 0–10% *iso*-butane in a C_4, C_5 hydrocarbon stream is given. Other applications of infra-red analysers to process control (pp. 1382–96) include such diverse fields as the production of acrylonitrile

and the monitoring of gas streams in butane splitting processes. Sensitizing non-dispersive infra-red analysers is described by Woodhouse *et al* (p. 1396). 2 instruments designed for continuous process monitoring of gas streams are described; a portable mass spectrometer (p. 1400) and a compact ion resonance mass spectrometer (p. 1404). Other instruments mentioned are a recording differential refractometer (p. 1409); an U.V. spectrophotometer for automatic control (p. 1413); an automatic sediment and moisture recorder adapted to material transported by petroleum products in pipelines (p. 1418); a potentiometric instrument recording trace quantities of oxidizable sulphur compounds in gas streams at concn of 0·1 to several hundred p.p.m. (p. 1422); automatic instrumentation for bench scale units (p. 1428), and a Beckman flow colorimeter (p. 1432). B. A. F.

232. What is the octane picture? Pt II. Road rating effects. J. S. Bellah and W. E. Morris. *Petrol. Refin.*, 1954, **33** (9), 315–18.—General correlations of Research O.N., Motor O.N., T.E.L. levels, and gasoline composition with road octane values are described, and a method of applying these relationships to obtain optimum usage of refinery stocks is outlined. R. D. S.

233. Gasoline blending stocks. R. E. Maples. *Petrol. Refin.*, 1954, **33** (9), 284–99.—A series of charts is presented to provide comparative lead susceptibilities and sensitivities of the usual refinery blending stocks. To aid in interpreting these charts another series is drawn for hydrocarbons. A third series permits the reference to some standard octane no. of the different qualities of gasoline obtained from any given cracking stock by different cracking severities. The method is based on the yield–octane relationships for both thermal and cat reforming. R. D. S.

234. Locating optimum feed tray. S. R. M. Ellis. *Petrol. Refin.*, 1954, **33** (9), 307–9.—An equation is presented for the rapid calculation of the number of equilibrium stages above the feed tray. Good agreement with tray to tray analysis is obtained for a large number of binary and multicomponent systems. R. D. S.

235. Patents. U.S.P. 2,682,765 (31.7.51; 6.7.54). P. McCutchan and D. A. Young, assrs to Union Oil Co of California. Device for determining fl. pt. of liq on a micro scale. J. M. S.

Ger.P. 917,214, 15.7.54. — Denker and — Pawlik, assrs to Reichswerke AG für Erzbergbau und Eisenhütten, Salzgitter-Drütte. Process and apparatus for estimating unburned in flue dust.
BrennstChemie, 1954, **35** (15–16). R. T.

CRUDE OIL

236. Study of some Middle East crudes. IV. Aramco crude. Anon. *Rev. Inst. franç. Pétrole*, 1954, **9**, 503–8 (*cf* Abs. **1476**, 1954).—Results of pilot plant evaluation. Crude (d_4^{15} 0·846, S 1·4%, wax 2·4%, asphaltenes 0·4%) atm and vac fract into 81 1% cuts, which were tested and blended. Yields are (wt %): gas 0·8, gasoline (189° C) 25·8 (O.N. Motor 38 clear, + 0·05% TEL 59), kerosine (194–218) 4·6, gas oil (222–345) 24·1 (cetane 68, pour −22° C). V. B.

237. Properties of porphyrins in petroleum. H. N. Durning *et al*. *Industr. Engng Chem.*, Sept. 1954, **46** (9), 2000–7.—A water spray extraction method was used to concentrate surface active porphyrin compounds of a crude oil. The porphyrin and metal contents and the interfacial activities of the fractions obtained by extraction were determined. Metal porphyrins were found to be concentrated at the interface. B. A. F.

GAS

238. Patents. Ger.P. 916,662, 8.7.54. — Leithe and — Mewes, assrs to Dr C. Otto & Comp. G.m.b.H., Bochum. Method for valuable synthesis gas production from ballast-rich fuels.

Ger.P. 917,085, 15.7.54. — Daniels, assr to Koppers G.m.b.H., Essen. Plant for hot-burning fuel gas production by pulverulent or fine-grained fuel gasification. (Addn to Pat. 765,992.)

Ger.P. 917,245, 22.7.54. — Wessolek, assr to H. Koppers G.m.b.H., Essen. Device for making fuel gas non-luminous and graphite separation in chamber-ovens producing gas and coke.

Ger.P. 917,447, 22.7.54. — Totzek, assr to Koppers G.m.b.H., Essen. Synthesis gas production from pulverulent fuels.

Ger.P. 917,560, 29.7.54. — Dorschner, — Herbert, and — Gross, assrs to Metallges. AG, Frankfurt (M.). Method for detoxicated town gas production by cat CO hydrogenation to liq and solid hydrocarbons.

Ger.P. 917,561, 29.7.54. — Pilz and — Joklik, Wien. Process and plant for CO-poor town gas production.
BrennstChemie, 1954, **35** (15–16).

Ger.P. 917,806, 5.8.54. — Flesch, assr to BASF AG, Ludwigshafen (Rhein). Process for granular to pulverulent fuel gasification.

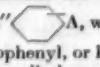
Ger.P. 918,161, 12.8.54. — Gross, — Tramm, and — Roelen, assrs to Metallges. AG, Frankfurt (M.). Process for CO-containing gas detoxication.

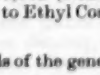
Ger.P. 918,224, 12.8.54. — Bartholeme, — Lehrer, and — Lorenz, assrs to BASF AG, Ludwigshafen (Rhein). Process for C_2H_2 separation from gases. (Addn to Pat. 870,886.)

Ger.P. 918,223, 12.8.54. — Roelen and — Royen, assrs to Metallges. AG, Frankfurt (M.). Process for detoxicating gases containing CO and H_2.
BrennstChemie, 1954, **35** (17–18).

Ger.P. 918,990, 2.9.54. — Weiler, assr to Adolf Messer G.m.b.H., Frankfurt (M.). Process and plant for separating gas mixtures.
BrennstChemie, 1954, **35** (19–20). R. T.

ENGINE FUELS

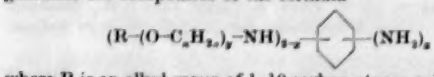
239. Patents. U.S.P. 2,683,081 (9.12.50; 6.7.54). E. F. Hill and D. O. de Pree, assrs to Ethyl Corpn. Antioxidants for use in gasoline are compounds of the general formula R′NHCX·NR″  A, wherein R′ is an alkyl, aryl, hydroxyphenyl, aminophenyl, or lower alkylaminophenyl group, R″ is hydrogen or an alkyl or aryl group, A is a hydroxy, amino, or lower alkylamino group, and X is oxygen or sulphur.

U.S.P. 2,683,082 (9.12.50; 6.7.54). E. F. Hill and D. O. de Pree, assrs to Ethyl Corpn. Antioxidants for use in gasoline are compounds of the general formula ArNHCONR′  OH, wherein Ar is an aryl group, R′ is hydrogen or an alkyl, *cyclo*alkyl, aralkyl, or alkenyl group, and R is as for R′ but not hydrogen.

U.S.P. 2,683,083 (9.12.50; 6.7.54). E. F. Hill and D. O. de Pree, assrs to Ethyl Corpn. Antioxidants for use in gasoline are N′-(*p*-hydroxyphenyl) ureas substituted on the N-nitrogen atom by an acyclic or cyclic paraffin radical of up to 18 carbon atoms.

U.S.P. 2,684,293 (22.1.52; 20.7.54). E. F. Hill and D. O. de Pree, assrs to Ethyl Corpn. T.E.L. is stabilized with a di-substituted dihydroxybenzene in which one of the substituents is an alkylaminomethyl group and the other is an alkylaminomethyl or a methyl group.

U.S.P. 2,684,893 (1.10.51; 27.7.54). E. C. Hughes and S. M. Darling, assrs to Standard Oil Co. Gum inhibitors for gasolines are compounds of the formula



where R is an alkyl group of 1–10 carbon atoms, n is 1, 2, or 3, x is 0 or 1, and y is 1–5. J. M. S.

GAS OIL AND FUEL OIL

240. Industrial liquid fuel burning installations. Burner Manufacturers Association. *Petrol. Times*, 29.10.54, **58** (1493), 1125.—A memorandum submitted by the council of the British Oil Burner Manufacturers' Association to the Air Pollution Industrial Sub-Committee of the Ministry of Fuel and Power is reproduced in full. It discusses principles of design in relation to plant capacity and layout, ventilation, chimney design, selection of type of plant, combustion chambers, preheating of oil, and air controls. Operation and maintenance, training of operatives, and instrumentation are also considered. G. A. C.

241. Patents. U.S.P. 2,684,292 (13.3.51; 20.7.54). J. B. R. Caron, C. Wies, and E. B. Glendenning, assrs to Shell Development Co. Dist fuel oils containing cracked components are doped with oil-sol aliphatic amines having an alkyl group of 14–18 carbon atoms to prevent filter, etc., clogging.

U.S.P. 2,684,894 (12.12.51; 27.7.54). J. J. Trexel, assr to Standard Oil Development Co. Fuel oils containing at least 20% of cat cracked components are doped with a 10% aq soln of an alkali metal chromate to inhibit sludge formation. J. M. S.

LUBRICANTS

242. Lubricating oil requirements of the modern automotive engine. J. P. Hamer, T. S. Tutwiler, and C. A. Weisel. *Bull. Amer. Soc. Test. Mat.*, May 1954, (198), 70–7.—Recent design trends in the automotive engine are discussed with special relation to lubricant requirements, and practical points concerning the use of low visc oils are considered in detail, together with the connexion between visc, consumption, and cold starting. The significance of pour points is explained, and the effect of oil visc on fuel economy is discussed. Other topics treated include engine cleanliness, crankcase and combustion chamber deposits, and the effect of detergent inhibitor additives on engine wear. J. G. H.

243. What lubrication means to the builder of machine tools. J. J. Jaeger. *Lubric. Engng*, Apr. 1954, **10** (2), 89–91.—While the complex nature of many modern machine tools calls for a lubrication system built into the design of the equipment, there still remain problems of a general nature common to most installations. Difficulties encountered with journal bearings, rolling element bearings, sliding ways, and cutter lubrication are discussed, and the possible contribution of correct lubrication to the maintenance of a long and trouble-free life for expensive equipment is stressed. J. G. H.

244. Lubrication of gears—5. Gear tooth wear, cause, and effect. Anon. *Sci. Lubric.*, May 1954, **6** (5), 22–6.—The series of drawings of worn gear teeth published by the American Gear Manufacturers' Association under the designation "AMGA Standard Nomenclature," 20 in number, are reproduced with brief notes and additional data on pitting, scoring, spalling, abrasive wear, and scuffing. J. G. H.

245. Lubricating oil tests. E. W. Steinitz. *Auto. Engr*, Sept. 1954, **44** (9), 375.—The significance of oil specifications is discussed, and details of short laboratory tests for assessing the quality of oils are given. The legend for Fig 4 is incorrect. 2 refs. T. T.

246. Engine wear as affected by lubricant composition. H. C. Mougey. *Bull. Amer. Soc. Test. Mat.*, May 1954, (198), 57–64.—The types of wear encountered in I.C. engines are enumerated and the seriousness of corrosive wear is indicated. The effect of engine wear on oil consumption is discussed, and the severe conditions encountered under slow-speed, intermittent, and stop-and-go operation are emphasized. The value of corrosion-resistant oils in ensuring trouble-free operation is remarked, and details of a General Motors corrosion resistance test are presented in full. J. G. H.

247. Substituted ureas as grease thickeners. E. A. Swakon, C. G. Brannen, and L. C. Brunstrum. *Inst. Spokesm. Nat. Lubric. Gr. Inst.*, Apr. 1954, **XVIII** (1), 8–13.—The severe conditions encountered in aircraft and in certain special industrial lubrication systems call for the development of special greases with wide temp ranges and increased compatibility of components. While silicone fluids have valuable properties, their use has been limited by the lack of satisfactory thickeners. Of the thickening materials investigated, arylureas have been found to have most of the desired properties, and greases combining silicone fluids and arylureas have been subjected to conventional tests and to extensive performance tests in the low-temp torque tester, Navy Gear Wear Tester, the ABEC–NLGI Bearing Tester, and in the Navy-Industry motor-generator set. Properties of these greases and of the test results obtained are set out, and modifications in formulation in order to obtain other desired properties are indicated. J. G. H.

248. Evaluation of wheel bearing grease performance. E. O. Forster and J. J. Kolfenbach. *Inst. Spokesm. Nat. Lubric. Gr. Inst.*, May 1954, **XVIII** (2), 8–14.—The increasingly severe conditions encountered by automotive wheel bearings call for improved greases and extensive field testing of greases as opposed to conventional lab tests, which are only useful as a preliminary screening process. Details are presented of field tests using passenger cars and heavy duty trucks for the evaluation of 4 greases. Evaluation was based on leakage characteristics of the greases and on the general appearance of the greases and bearings at the end of the tests. Comparison of results so obtained with those of 100,000 stroke penetration tests confirmed that the latter give no indication of possible field performance. While faulty lubricant quality or application is frequently blamed for bearing failure, other conditions, including overpacking, fretting corrosion, or metallurgical defects, are as often responsible. J. G. H.

249. Evaluation of lubricants for the cold rolling of brass. J. W. Johnson. *Lubric. Engng*, Apr. 1954, **10** (2), 80–3.—Details are presented of an experimental method for the evaluation of brass rolling lubricants using a 2-high cold mill fitted with strain gauge load cells, and rolling cartridge brass. Method of evaluation was by measurement of coeff of friction with all variables excepting pressure and reduction in thickness held constant. Equipment and procedure used are described in some detail, and results obtained with straight mineral and with compounded oils of varying visc are tabulated. The effect of roll finish on friction is also discussed. J. G. H.

250. Review of synthetic lubricants. D. H. Moreton. *Lubric. Engng*, Apr. 1954, **10** (2), 65–73.—The constitution and special functions of synthetic lubricants are discussed, together with reasons for their present high cost. The characteristic properties and functions of monobasic and diabasic acid esters, phosphate esters, silicones, silicate esters, polyglycol esters, and fluorinated and chlorinated compounds as used for this purpose are set out, and the importance of the full availability of toxicological information on these compounds is emphasized. 48 refs. J. G. H.

251. Something has been added: thirty years progress in the improvement of fuels and lubricants by the use of additives. L. C. Beard. *Bull. Amer. Soc. Test. Mat.*, May 1954, (198), 51–6.—The variety of applications of additives in liq fuels

and lubricants is illustrated by functional enumeration; ASTM methods for evaluation are tabulated, and the economic significance of additives is briefly indicated. The contribution made to the solution of corrosion problems within the oil industry by the use of inhibitors is discussed, and other applications of additives are touched upon. J. G. H.

252. Study of the role of the cutting fluid in machining operations. S. J. Beaubien and A. G. Cattaneo. *Lubric. Engng*, Apr. 1954, **10** (2), 74–9.—The functions of a cutting fluid in the machining operation and the significant properties of the fluids used are indicated. The effect of fluid properties on tool life where the latter is limited by excess heat, by wear, and by welding is discussed, together with the relationship between properties and surface finish under single and multiple contact cutting and thread cutting, and the effect of fluid properties on tool forces. J. G. H.

253. Bearings, lubricants, and lubrication. A digest of 1953 literature. Anon. *Mech. Engng, N.Y.*, Sept. 1954, **76** (9), 739.—A bibliography of 136 papers covers the following subjects: journal bearings, ball and roller bearings, thrust bearings, automotive lubricants, gear lubrication, metal-working lubricants, boundary lubrication, and properties of lubricants. T. T.

254. Patents. U.S.P. 2,683,119 (16.11.49; 6.7.54). P. V. Smith, L. A. Mikeska, and A. H. Popkin, assrs to Standard Oil Development Co. Mineral lub oil containing 1–20 wt % of an ester of the formula

$$R'COOR''OOCR'''SR'''COOR''OOCR'$$

where R′ is an aliphatic hydrocarbon radical of 1–18 carbon atoms, R″ is an aliphatic hydrocarbon radical, which may be interrupted by S atoms and contains 2–8 carbon atoms, and R‴ is an aliphatic hydrocarbon radical of not more than 8 carbon atoms. The ratio of carbon to S atoms in the ester does not exceed 25 : 1.

U.S.P. 2,683,691 (18.8.51; 13.7.54). R. E. Thorpe and E. R. Bell, assrs to Shell Development Co. E.P. additives for lub oils are salts of *sec*-amines of 10–36 carbon atoms with compounds of the formula $RPO(O_mR')(OH)$, where R is a polyhalogenated hydrocarbon radical of 1–8 carbon atoms, R′ is hydrogen or an alkyl, aryl, aralkyl, alkaryl, or *cyclo*alkyl radical, and *m* is 0 or 1.

U.S.P. 2,683,694 (16.8.50; 13.7.54). A. E. Hoffman, J. A. Chenicek, and H. E. Whitmore, assrs to Universal Oil Products Co. Antioxidant composition comprising 50–90 wt % butylated hydroxyanisole and 10–50 wt % propyl gallate.

U.S.P. 2,684,311 (18.2.50; 20.7.54). F. Fortess, assr to Celanese Corpn of America. Regenerated cellulose yarns are lubricated with a composition comprising the diethanolamide of lauric acid, an aryl sulphonate, 2-ethyl-1, 3-hexanediol, and 2-ethylhexanol.

U.S.P. 2,684,334 (25.5.51; 20.7.54). J. G. Ryan and G. L. Hayes, assrs to Shell Development Co. Lub oils containing 0·1–5% each of a P_2S_5–terpene reaction product and a 2,4,6-trialkylphenol.

U.S.P. 2,684,335 (22.6.51; 20.7.54). R. L. Heinrich and A. J. Shmidl, assrs to Standard Oil Development Co. Reaction products of diphenylamine and trithioacetone are used as oxidn inhibitors.

U.S.P. 2,684,336 (2.6.50; 20.7.54). D. H. Moreton, assr to Douglas Aircraft Co. Lubricant comprising a liq dimethyl silicone polymer and a trialkyl phosphate in which the alkyl groups have 3–10 carbon atoms.

U.S.P. 2,684,943 (1.11.50; 27.7.54). E. R. Baker, assr to Continental Oil Co. Lubricants liable to evolve H_2S are doped with an epoxy compound and a metallic salt of a sulphonic acid.

U.S.P. 2,684,944 (2.6.52; 27.7.54). S. J. Zajac, assr to Standard Oil Co. Greases comprising a liq polyorgano siloxane, a lithium soap of a fatty acid, and a free basic compound. J. M. S.

Ger.P. 917,028, 15.7.54. — Metzger, — Rössig, and — Zorn, assrs to BASF AG, Ludwigshafen (Rhein). Lubs.
BrennstChemie, 1954, **35** (15–16).

Ger.P. 918,312, 9.9.54. — Rössig and — Zorn, assrs to BASF AG, Ludwigshafen. Lubs.
BrennstChemie, 1954, **35** (19–20). R. T.

BITUMEN, ASPHALT, AND TAR

255. Preparation of bituminous films by spinning. L. R. Kleinschmidt. *Bull. Amer. Soc. Test. Mat.*, Oct. 1953, (193), 53–5.—A method is described for the preparation of asphaltic films for the study of weathering properties. Based on an earlier technique developed for the preparation of paint and varnish films, aluminium disks are mounted on a rotating table driven by an electric motor and heated by a ring burner, built in below the table. Variations in the thickness of the film produced are obtained by adjustment of speed of rotation and control of temp of the asphaltic material. Details are also given of the method adopted for the removal of occluded air from blown asphalts. J. G. H.

256. Method of preparing uniform films of bituminous materials. S. H. Greenfeld. *Bull. Amer. Soc. Test. Mat.*, Oct. 1953, (193), 50–3.—Limitations of, and difficulties experienced in the use of earlier equipment for the preparation of films of, bituminous materials for testing purposes are discussed, and details are presented of a new method employing a hydraulic press modified in order to prevent bitumen adhesion and retard cooling. Methods and equipment described proved successful on a wide variety of materials, including coal tars and many types of asphalt, both stabilized and unstabilized. J. G. H.

257. Effects of thermal shock on the durability of asphalt coatings under accelerated test. S. H. Greenfeld. *A.S.T.M. Bull.*, Oct. 1953, (193), 46–50.—The development of accelerated durability tests for asphalts intended for roofing is briefly surveyed and the extended use of redesigned Weatherometers for this purpose is noted. The desirability of including in such tests a convenient form of thermal shock is remarked. Details are presented of equipment, materials, and procedure used for the purpose, the desired conditions being exposure to air at −5° F for 2 hr daily. Results so obtained with 3 representative asphalts indicated that such a test had no significant effect of the durability or failure pattern of either stabilized or unstabilized asphalts. J. G. H.

258. Patents. U.S.P. 2,684,267 (12.12.49; 20.7.54). W. M. Madsen, assr to Madsen Iron Works. Asphalt pressure injection system and mechanism for asphalt mixing plants. J. M. S.

Ger.P. 917,388, 22.7.54. — Schneider, assr to Fa. Still, Recklinghausen (Westf.). Coke plant device for tar separation, storage, and loading.
BrennstChemie, 1954, **35** (15–16).

Ger.P. 919,205, 2.9.54. — Eiche, — Schulte, — Bocholt, and — Schlumberger, assrs to Eisenwerke Gelsenkirchen, and Gelsenkirchener Bergwerks-AG, Essen. Filter for bitumens and pitches viscous to plastic at normal temp.

Ger.P. 919,495, 16.9.54. — Grundmann and — Stickdorn, assrs to DEHYDAG Deutsche Hydrierwerke G.m.b.H., Düsseldorf. Method for producing stable aq emulsions of tar oils, carbolineum, bituminous liq.

Ger.P. 919,496, 16.9.54. — Vogel, assr to Vogel, Leutkirch (Allgäu), and Hockel, Leutkirch (Allgäu). Bitumen emulsion production.
BrennstChemie, 1954, **35** (19–20). R. T.

SPECIAL HYDROCARBON PRODUCTS

259. Present position of the insulating oil problem. H. Weiss. *Bull. Soc. franç. Élect.*, 1954, **4**, 527–35.—Detailed description of tentative test procedure, suggested to IEC committee No. 10 by its permanent sub-committee, described (*cf* Abs **1253**, 1954). Apparatus of ASTM D 670–42 (A), 25 g oil, 1 litre O_2/hr, 100° C, Cu wire cat (12 inches 0·040 inch dia), 164 hr, measure acidity and sludge. Tests also carried out with Fe wire and soluble Cu and Fe (naphthenates) as cat. Results (reported at Windsor meeting, June 1953, of permanent sub-committee of IEC No. 10) on both current commercial and experimental oils reviewed. Solid Fe alone has negligible cat action, use of soluble Fe + Cu (20 p.p.m. each) appears promising and can reduce test duration to 48 hr. Account also given of work of CIGRE insulating oil study committee (No. 1) on measurement of p.f. and dielectric strength. 6 papers on insulating oil, read to IEE in March 1953, are summarized. V. B.

260. Measurement of the dielectric strength of insulating oils. H. Josse and Y. Enault. *Bull. Soc. franç. Élect.*, 1954, **4**, 536–42.—Sampling precautions detailed and test methods current in various countries described. Recommended procedure is successive tests on same sample till 5 results obtained with no divergence >25% from mean, this yields value with error ±6%. Conversion factors given for apparatuses having 12·5-mm dia spheres or curved electrodes of 25 mm radius, for gaps 1–5 mm. Authors recommend cell (drawing) with horizontal elliptical (axes 10 and 20 mm) electrodes at 2 mm gap, oil vol 350 ml. Minimum permissible dielectric strength in U.S.E. apparatus should be 60 kV (present French standard 40 kV), with preference for values >90 kV. Inert gas (N_2) atmosphere recommended for transformers. V. B.

261. The reclamation of insulating oils. F. C. Doble. *Petrol. Times*, 29.10.54, **58** (1493), 1116.—A critical survey of the subject is given, background, definitions, history and insulating oil tests, reclamation oil deterioration in terms of accelerated oxidn tests, and principles of a reclamation programme. G. A. C.

262. Recent observations on changes undergone by Pirelli-type cable oils in service. T. Salomon. *Bull. Soc. franç. Élect.*, 1954, **4**, 557–69.—Oils examined after 20 years operation in 2 similar cables, one of which had severe overloading for a few months (temp 160° C against 70° C) and showed high dielectric loss, decreasing with rising temp. Oil from overloaded cable had greater acidity (1·44 against 0·25), greater sludge-forming tendency, and contained deposit which, after removal of $CHCl_3$-soluble portion, had average composition $C_9H_{14}O_4Fe_2{\cdot}\frac{1}{2}H_2O$. Fe is considered to be polymerization cat and can react with oxygen-containing oil components (pre-existent or formed during oil oxidn) to form organo-ferric compounds, these polymerize to macromolecules which can further increase in size by adsorption effects; such effects are less at higher temp, explaining lower dielectric loss. Overloaded cable was regenerated by flushing and refilling with new oil. V. B.

263. Factors affecting transformer oil stability. R. A. Grierson. *Tech. J. Brush Gp.*, 1954, **2**, (3), 2–5.—Coils of 20 s.w.g. double cotton covered Cu wire, treated with 14 different grades of insulating varnish, maintained at 95° C in transformer oil for 12 weeks. Oil acidity was 0·07 (control)–0·23, thermo-setting varnishes tended to give lower results than oxidizing and, for most of former, little or no change in acidity compared to control sample noted. Results of dielectric strength tests after heating given. V. B.

264. Patents. U.S.P. 2,683,120 (29.8.50; 6.7.54). L. A. Jennings, J. J. Schlaer, and W. C. Howell, assrs to Standard Oil Development Co. Hydraulic oil comprising 51·6–61·2 wt % solvent extracted mineral oil having a visc of 36 SSU at 210° F and a V.I. of 107, 20–30 wt % mixed butylene–pentylene alkylate having a visc of 37 SSU at 210° F, a fl. pt. of at least 350° F and a boiling range between 600° and 750° F, 11·8–12·2 wt % oil soln of polybutene having a mol. wt. of 10,000–20,000, 4·4 wt % of a mixed barium alkyl phenol sulphide and high mol. wt. calcium sulphonate in oil, 1 wt % sulphurized sperm oil, and 0·4 wt % of an oxidn inhibitor.

U.S.P. 2,684,338 (25.5.49; 20.7.54). F. L. McGowan and J. P. Conley. Emulsifiers for emulsifying paraffin wax comprise a water-sol soap, a fatty acid of 12–19 carbon atoms, an alkyl naphthalene and glycerol, ethylene glycol or its monobutyl ether, 2-methyl-2,4-pentanediol or diethylene glycol or its mono-butyl- or -ethyl ether.

U.S.P. 2,684,948 (12.12.50; 27.7.54). S. T. Cross, assr to Atlas Powder Co. Emulsifiers for emulsifying paraffin wax comprise a mixture of a partial ester of a polyhydroxy compound, a polyoxyethylene ether of such ester, a polyhydroxy compound, and a hexitol monoborate. J. M. S.

Ger.P. 916,782, 8.7.54. — Zerbe, assr to Deutsche Shell AG, Hamburg. Process for obtaining petroleum resins. *BrennstChemie*, 1954, **35** (15–16).

Ger.P. 919,599, 16.9.54. — Kölbel, assr to Rheinpreussen AG für Bergbau und Chemie, Homberg. Process for obtaining light oils.

Ger.P. 919,770, 23.9.54. — Klein, assr to BASF AG, Ludwigshafen. Method for gaseous unsaturated hydrocarbon production. *BrennstChemie*, 1954, **35** (19–20). R. T.

DERIVED CHEMICAL PRODUCTS

265. Patents. U.S.P. 2,683,151 (14.3.49; 6.7.54). J. C. Hillyer and D. A. Nicewander, assrs to Phillips Petroleum Co. 2,3,4,5-bis (Δ2-butenylene)-tetrahydrofurfural.

U.S.P. 2,683,157 (2.10.52; 6.7.54). V. Weinmayer, assr to E. I. du Pont de Nemours and Co. Carboxy*cyclo*pentadienyl (*cyclo*pentadienyl) iron.

U.S.P. 2,683,161 (12.10.50; 6.7.54). W. S. Knowles and J. Dazzi, assrs to Monsanto Chemical Co. Aryl alkane sulphonates derived from petroleum hydrocarbons are stabilized by heating them to 110°–300° C. J. M. S.

Ger.P. 917,666, 29.7.54. — Jäger, Düsseldorf. Method and plant for phthalic acid anhydride production.

Ger.P. 917,667, 29.7.54. — von Schuchmann, assr to Böhme Fettchemie G.m.b.H., Düsseldorf. Method for higher aliphatic unsaturated alcohol production. *BrennstChemie*, 1954, **35** (15–16). R. T.

COAL, SHALE, AND PEAT

266. Plastic behaviour of coals. H. Hoffmann and K. Hoehne. *BrennstChemie*, 1954, **35** (13–14), 202–11; (15–16), 236–46; (17–18), 269–75; (19–20), 298–304.—Plastic properties of coal are determined by the dilatometer, which gives expansion capacity, and by the plastometer, which gives flow capacity. The former identifies the behaviour of the basic coal substances, the latter the nature or ripeness of the bitumen. Both play an important part in the agglomeration process of coke formation, and their simultaneous use leads to a comprehensive judgment of coking capacity of a coal. Charged coals with medium expansion val yield the best cokes without excess bitumen yield. The max plasticity of such suitable coal should not be too high, and should be adjusted to the carbonization degree of the basic components of the coal. With very high carbonization degree low max plasticity val is necessary, with decreasing carbonization degree plasticity max val must be correspondingly higher. In all cases a very wide plastic zone reaching the max possible temp zone is particularly favourable for the quality and regularity of the coke produced. The great variation in plasticity of the different granulations of the charged coals makes grinding necessary,

also compression to make the bulk density independent of the granulation. Numerous tabulations and charts are given. R. T.

267. Reactions of fuel sulphur in low temperature carbonization and destructive distillation processes. E. Terres. *BrennstChemie*, 1954, **35** (15–16), 225–31.—Factors discussed, which control reaction of S in fuel gasification are: type of S-compounds and of other mineral constituents, and temp conditions. However, S exists in the final gas chiefly as H_2S, and in the slag as sulphate and sulphide. 32 literature refs and numerous charts. R. T.

268. U.S. Bureau of Mines research on synthetic liquid fuels. Anon. *Petrol. Times*, 15.10.54, **58** (1492), 1065.—Pt II of this report reviews progress in making oil from coal and shale in 1953. The report itself gives a detailed description, including flow-sheets and diagrams, of the retort which evaluates the operability of the gas combustion process on a large pilot-plant scale. Hydrogenation at 3000 p.s.i. with cobalt molybdate as cat, research on chemical and physical characteristics of kerogen in shale, and work on properties and treatment of products from entrained-solids retort are among subjects dealt with. G. A. C.

MISCELLANEOUS PRODUCTS

269. The first World Detergents Congress in Paris. Anon. *Petrol. Times*, 29.10.54, **58** (1493), 1121.—Among papers presented were those on production of secondary alkyl sulphonates, the stability of liq detergents at low temp, the rôle of detergents in raw wool washing, the use of detergents in the leather, fur, paper, laundry, metallurgy, and pharmaceutical industries, and also in mining, agriculture, and food processing. G. A. C.

270. Patent. Ger.P. 918,660, 19.8.54. — Schlumberger, assr to Bergwerks-AG, Essen. Method for producing synthetics from too-fluxing coal tar pitches. (Addn to Pat. 914,675.) *BrennstChemie*, 1954, **35** (17–18). R. T.

CORROSION

271. Corrosion control in gas lift wells. D. A. Shock and J. D. Sudbury. *Corrosion*, 1954, **10** (9), 289–94.—Conditions in gas lift wells producing appreciable proportions of water are reviewed. The principal cause of corrosion is reported to be carbon dioxide. In view of the importance of the ionic composition and chemical content of produced waters the scaling problem is also an important consideration in selecting a suitable inhibitor. Chemicals used to inhibit corrosion in these wells must have the ability to penetrate the column of oil and water standing in the well. Work in the laboratory, using a model gas lift well and actual produced fluids, has shown that some available inhibitors have the disadvantage of forming insoluble salts with Ca and Mg ions. Although satisfactory in laboratory tests, arsenical inhibitors were subsequently found to be unsuitable under actual service conditions. Investigations of organic polar compounds weighted with ethylene glycol resulted in the author's company developing its own inhibitors. W. G. R.

272. Survey of corrosion control in California pumping wells. F. E. Davie and P. W. Hill. *Corrosion*, 1954, **10** (8), 248–51.—Information, collected and correlated using hand-sort punch cards, was obtained from 17 fields and 14 companies, and covers some 350 wells varying from 1000 to 8000 ft in pump depth and producing up to 1000 b.d. gross.

The survey indicates that the use of various inhibitors has so far resulted in an average of 50% reduction in pulling jobs. Material replacements have been reduced by an even greater percentage. W. G. R.

273. Industrial applications of a method for measuring small amounts of corrosion without removal of corrosion products. A. Dravnieks and M. A. Cataldi. *Corrosion*, 1954, **10** (7), 224–30.—The method, involving the electrical resistance technique, can detect corrosion losses to a fraction of a microinch and does not require the removal of corrosion products or other deposits. The main usefulness of the method is in establishing the relative corrosivities of media which are closely alike.

Several typical applications are given: (1) the determination of the relative corrosivities of crude oils at refinery temp; (2) the identification of the source of the corrosive components responsible for the attack in a vis-breaking unit charging a complex feed mixture; (3) the determination of the corrosivity of sulphuric acid sludges; (4) a quantitative assessment of oil-soluble rust inhibitors; and (5) the determination of the corrosivity—to lead—of oxidized lub oils as a function of the degree of oxidn of the oils. W. G. R.

274. Comparisons of cathodic protection test methods. K. M. Logan. *Corrosion*, 1954, **10** (7), 206–11.—This paper compares the results of cathodic potential tests, including and excluding I.R. drop and with the reference electrode both over and remote from the pipe. Results of using the break in the current potential curve as a criterion for protection are compared with lowering the pipe potential 0·3 volt and to lowering the potential to −0·85 volt. The criteria do not agree. In the types of soil used, the authors found it possible to get a distinct break in current-potential curves if the I.R. drop is eliminated. When the I.R. drop is included in the pipe potential the current required to lower the pipe to −0·85 volt depends on the distance between the reference electrode and the pipe. When no current is applied to the pipe the potential of the pipe with respect to a reference electrode over the pipe may or may not be the same as that referred to a remote electrode. It is doubted whether a null method is justified, due to the possibility of errors from the equipment and adjustments involved nullifying the advantage of the elimination of the I.R. drop. Apparently, under some conditions, protection is attained before the pipe potential is lowered to −0·85 volt with respect to a copper sulphate electrode, and it is possible that the break in current-potential curve is a better criterion for protection. W. G. R.

275. A promising spray-applied inhibitor of internal corrosion of oil tank ships. J. D. Sudbury, D. A. Shock, and F. W. Mann. *Corrosion*, 1954, **10** (8), 253–8.—After reviewing the problem in ships operating between Gulf and E. Coast ports of the U.S.A., the authors proceed to discuss current protective methods.

Laboratory experiments are described in which soluble oil, sodium dichromate, sodium nitrite, benzoic acid, and a commercial organic inhibitor are tested. Because of the good showing made by a sodium alkyl aryl sulphonate inhibitor, formulations incorporating calcium sulphonate and sodium sulphonate with rosin amine stearate as a tackifying agent were tested. The best formulation was adopted for shipboard tests which are now in progress. W. G. R.

276. Patents. U.S.P. 2,684,332–3 (29.12.50; 20.7.54). G. H. Rohrback, D. M. McCloud, and W. R. Scott, assrs to California Research Corpn. Pelleted corrosion inhibitors comprising sodium arsenite and arsenous oxide or zinc. J. M. S.

SAFETY PRECAUTIONS

277. Petrol fire extinction by base injection. Anon. *Petrol. Times*, 15.10.54, **58** (1492), 1072.—The report is reviewed of the Fire Research Board for 1953. It is now possible to extinguish a fire in a large petrol tank by base injection of foam. Use of sprays on liq fires and toxicities of extinguishing agents are also subjects of the report. G. A. C.

MISCELLANEOUS

278. Oil imports and the coal industry in the U.S.A. W. J. Levy. *Petrol. Times*, 29.10.54, **58** (1493), 1100.—The relationship of the coal industry to oil imports is discussed, together with the importance of technology, what the coal industry proposes, inefficient refining, "dumping," coal and oil in war, and the implications of a national fuels policy. G. A. C.

279. The wider use of oil as an industrial fuel. Anon. *Petrol. Times*, 15.10.54, **58** (1492), 1075.—Trends in use of fuel oil in British industry is reviewed by C. M. Vignoles. The price of the oil, use in metallurgical, glass, and ceramics industries, low-temp processes, gas making, diesel traction, new uses, and future of fuel oil are dealt with. G. A. C.

280. Influence of petroleum and natural gas on United States economy. G. Egloff. *Riv. Combust.*, 1954, **8** (5), 355–76.—The progress of the petroleum industry in recent years is reviewed and its impact on the economy of the U.S.A. is emphasized. The more significant technical achievements in the field of motor fuel and of petrochemicals are examined. Among the latter, particular reference is made to recent developments in synthetic rubbers, plastics, fibres, agricultural products, and detergents. (Author's abstract.)

281. Air pollution review 1949–1954. L. C. McCabe. *Industr. Engng Chem.*, Aug. 1954, **46** (8), 1646–50.—A review of the most important developments in the past 5 years. B. A. F.

282. Fire fighting equipment for bulk users of lubricating and electrical oils. G. H. Clark. *Sci. Lubric.*, May 1954, **6** (5), 15–21.—Fire hazards occurring in the vicinity of lubricating and electrical oils are briefly summarized and the necessary conditions for combustion indicated. Methods of fire extinction are enumerated, and the "Mulsifyre" system is described and illustrated in detail. J. G. H.

283. Oily industrial wastes. P. W. Uhl. *Lubric. Engng*, Apr. 1954, **10** (2), 87–8.—Difficulties encountered in the disposal of industrial wastes are remarked, and the special problems attendant on the disposal of used petroleum solvents, lub oils, and soluble oil emulsions are discussed. Recovery schemes are seldom economic propositions, and it is suggested that wherever possible methods of utilization of oil wastes in their untreated state be explored. J. G. H.

BOOK REVIEWS

Proceedings of the Second International Congress on Rheology (Oxford, 26–31 July 1953). Ed. V. G. W. Harrison. London: Butterworth's Scientific Publications, 1954. pp. ix + 451. 60*s*.

This book collects 55 papers given by rheologists to rheologists and briefly records the discussion ensuing on each paper. It is, therefore, a specialist's book. As such, it cannot and should not be judged by the standards by which a conventional book on rheology is normally judged. The latter type of book would possess advantages of logical arrangement and presentation, which by the very nature of this volume it cannot have. On the other hand, these "proceedings" afford one facility which not even the modern book written by a group of specialists under an editorial board can offer. At the end of each paper the discussion by the other experts in the field paints a background of appreciation and criticism, of comparison and contrast against which the papers may be set. Hence, although primarily the book collects original contributions to research made by individual authors, it does in fact provide also a rich harvest of references to other work, selected by their own authors as being the most significant of their work on the particular theme under discussion. In this way the majority of papers, when taken in conjunction with the discussion, become a compact, critical, enlightened, and enlightening guide to present-day thoughts on the subject.

Sir Geoffrey Taylor, whose contributions to hydro- and aerodynamics have placed him pre-eminently as an authority on problems of flow, contributes a foreword and a Presidential Address—in the latter he urges mathematicians dealing with flow to base their work firmly on physical and experimental facts. The rest of the Proceedings is divided into five main parts.

The first part consists of six papers of a general character dealing with electroviscous effects in colloids, rheological problems in plastics fabrication, rheology in applied mechanics, molecular mechanisms involved in rheology, water associations and hydrogels, and rheological problems in biology. These papers set the pattern for the rest of the book, as they were the key addresses and general lectures for the different sections of the Congress.

In the second part of the book, mathematical, experimental, and manufacturing problems involving the rheology of plastics yield 22 papers. They cover an extremely wide range and involve, probably, the whole field of rheology on the theoretical side, dealing as they do with the most complex systems in which elasticity, plasticity, and viscosity are indiscriminately mixed up.

Not very dissimilar in treatment and range of interest is the next part, in which 19 papers discuss the theory of, and practical results obtained from, the flow of materials possessing both viscosity and plasticity. Indeed, from a purely *rheological* viewpoint the line dividing these two parts of the book is very thin and arbitrary. Clays, metals, gels, and emulsions are the main types of materials concerned, but the theoretical treatment of the subject and the instruments developed for the evaluation of their rheological parameters cover a larger field of study.

Biological problems in which rheology is a major factor are discussed in three papers in the next section.

Readers of the Journal of the Institute will be interested mostly in the last section, which deals with rheological problems of oils and greases and of the processes of lubrication. Although only five papers go to make up this part, they are of good quality and, again, the discussion following each provides a good summary of present-day thinking on these problems.

The book ends with a brief though useful subject index, but lacks an author index.

The editing, printing, and binding of the book are good. To the rheologist these Proceedings are worth the price of 60*s*. A. H. N.

Design and Analysis of Industrial Experiments. Ed. Owen L. Davies. London: Oliver and Boyd for Imperial Chemical Industries, 1954. Pp. xiii + 637. 63*s*.

The vogue which the statistician is currently enjoying in the industrial field must largely be attributed not so much to advantages conferred by advanced statistical methods as to the failure of our education system to impart those fundamental principles of experimental procedure which form the basic stock-in-trade of the statistician. While the appropriate authorities are now beginning to face up to this deficiency, there remains a need for practising engineers, chemists, and physicists to graft such basic information on to their existing technical background.

The years since the war have seen a flood of statistical books designed to meet this need, but few can be said to have been entirely appropriate for this purpose, and some have possibly caused more harm than good through the teaching of methods without providing a proper appreciation of their limitations. It is a pleasure, therefore, to be able to report that "Design and Analysis of Industrial Experiments" stands head and shoulders above the majority, and gives a clear and balanced presentation of the basic principles and procedures invoked by modern experimental technique. The book is a sequel to "Statistical Methods in Research and Production," which was published in 1947. While the earlier book confined itself to a comparatively elementary exposition of the techniques of analysis, the later gives a very much more complete explanation of the experimental philosophy and presents additional methods of analysis, notably those appropriate to sequential experimental techniques.

Apart from the quality and style of presentation, which are uniformly excellent, especial mention should be made of a very clear chapter on simple sequential experiments, and also of the final chapter which gives the first textbook presentation of the sequential procedure developed by Box for the location of optimum points in multi-factor situations.

In so far as one may quarrel with the book, it is to be regretted that it is not easy reading, although the mathematics has been kept to a comparatively simple level and confined to appendices. The basic philosophy of experimentatio.. is dispersed throughout the book, and could with advantage have been summarized in a chapter along the lines of the introduction. The reviewer would prefer to have seen slightly more emphasis placed on estimation rather than on significance testing, but it is perhaps too much to hope that "significance," which is an undesirable piece of statistical jargon, might have been replaced by some such term as "established." In practice it may often be desirable to take decisions on the basis of data which would not be regarded as providing a significant result on the ground that the economics of the situation justified the decision in the light of the estimated probabilities of the situation.

There is little doubt that this book should be on the shelves of any laboratory library, and, indeed, it is probable that it will become the classic text for teaching purposes for a number of years to come. G. W. S.

Some Combustion Problems: Fundamental and Aeronautical Applications. London: Butterworth's Scientific Publications, 1954.

The volume under review consists of a collection of papers presented at a colloquium on combustion held under the sponsorship of the N.A.T.O. Advisory Group for Aeronautical Research and Development at Cambridge in December 1953. The object of the meeting was to attempt a general survey of the present state of knowledge in the combustion field, with particular reference to aeronautical applications. To this end the papers presented are chiefly surveys of the various fields of interest. Because of the character of the papers, this book will find a wider appeal than, for example, that reporting the Fourth Symposium on Flame and Combustion. Although the majority of data discussed in this volume were also included at the earlier symposium, there is in fact little duplication, due to the different manner in which the results are viewed.

The book is divided into a section on fundamental aspects which includes papers on the theory of laminar flame propagation, and a critical survey of experimental techniques available for examining the internal structure of a flame. Turbulent velocity theories are represented by two papers, one using the idea of flame-generated turbulence, and the other employing a mechanism of eddy diffusion. The burning of fuel droplets also furnishes the subject of a theoretical investigation.

On the applied side, combustion problems at high altitudes in turbine-propelled aircraft are discussed, as is combustion in vitiated air. The instability encountered in liquid propellant rocket motors due to the onset of pulsatory burning and the particular problem of the pulse-jet forms the subject of two reviews. Included in the discussion on rocket propulsion is an interesting contribution describing an experimental method of determining the maximum possible rate of heat release from a given fuel–air mixture which is of application to ram jet work.

The theory of liquid propellants is not at a very advanced stage, and security reasons limit the subject matter which may be discussed, but an interesting paper is included on the behaviour of some liquid nitric esters. The mechanism of combustion of solid propellants also receives attention, and techniques for measuring temperatures of the surface of the propellant below the flame are discussed.

From the brief summary of topics given above it can be seen that the book covers a very wide field, ranging from basic academic problems to highly applied technical developments in the combustion field. The standard of papers is excellent throughout, and any specialist in one particular part of the combustion field will find much to interest him in the other sections of the book. Several of the papers are in French, but adequate summaries in English are provided.

M. F. H.

Infra-Red Spectra of Complex Molecules. L. J. Bellamy. London: Methuen, 1954. Pp. xvii + 323. 35*s*.

Infra-red spectrometers now form part of the standard equipment of all large petroleum laboratories, where they are constantly being used for the examination and estimation of oil samples and products. There has thus developed a pressing need for a comprehensive treatise dealing with the interpretation of an infra-red spectrum in terms of the structural groups present in the substance being examined. Such a work would thus form an analytical handbook of immense value to the organic chemist. The difficulty has been to find an author with sufficiently wide experience to undertake the writing of such a handbook. Dr. Bellamy, however, has ably performed this task. His book contains in a well-ordered form the characteristic frequencies of a large number of functional groups, with a critical discussion of the reliability which can reasonably be attached to any particular group identification. It summarizes a vast and scattered literature and contains a comprehensive bibliography. Although a few other books are available dealing with limited classes of substances, this is the only book which can claim anything like complete coverage of the field. It is indispensable in any laboratory where an infra-red spectrometer is being used. W. C. P.

Clayton's the Theory of Emulsions and their Technical Treatment, 5th Edn. C. G. Sumner. London: J. & A. Churchill, 1954, pp. viii + 669. 72*s*.

The fact that this volume is the 5th edition of a work first published over 30 years ago is an indication of the important place occupied by this monograph in the technical literature. In revising the text for the present edition Dr Sumner has brought the material up-to-date and extended its scope while preserving the character of Dr Clayton's book.

As in previous editions, the general principles of physical

and colloid chemistry that bear on the subjects discussed are adequately summarized and provide the background to a very complete and accurate account of the academic and technological studies of emulsifying agents, emulsification, and the properties of emulsions. The views of the many investigators working in any particular field are recorded impartially and, usually, without critical comment or any attempt to give authoritative guidance to the reader. In consequence, the book lacks the stimulating effect of, for example, a work by the late Wilder D. Bancroft, but, on the other hand, leaves the reader free to judge for himself without prejudice.

The chapter reviewing the chemical constitutions and general properties of the great variety of synthetic emulsifying agents now available should be very useful in suggesting the types of substances most likely to give the special properties frequently demanded in technical emulsions. The chapters on biological and technical emulsions serve to emphasize the very wide field covered by the subject of emulsions and emulsification. In dealing with technical emulsions, no attempt has been made to discuss the many highly specialized applications in great detail, but the treatment has been, very wisely, restricted to a consideration of the general principles involved in each class of emulsions. A separate chapter has been devoted to the principles and practice of the important and interesting application of emulsions in the processes of polymerization.

In keeping with the scheme of the earlier part of the book, theoretical aspects of the dispersion mechanisms concerned in emulsification are first discussed, followed by a review of the great variety of emulsifying machines that have been devised for the preparation of emulsions, with a brief description of the more important types commonly used. The final chapter deals with the important subject of demulsification and there is an appendix giving a description of the more notable physical methods used in the examination of emulsions.

Throughout the book there is a wealth of references to academic, technical, and patent literature relating to the subject. The Author Index and the Subject Index are comprehensive and well arranged. This edition of Dr Clayton's well-known book will be indispensable to research workers and technologists in the field of emulsions.

J. F. T. B.

ADDITIONS TO THE LIBRARY

Report of Committee on Vaporizing Liquid Extinguishing Agents. Fire Research Technical Paper No. 2. London: H.M.S.O., 1954. Pp. 13 + vi. 1*s.* net.

This report reviews the properties of fire extinguishing agents and compares them with reference to the hazards for which they are suitable. The advantages of newer compounds such as chlorobromomethane and trifluorabromomethane are discussed.

The Manufacture of Synthesis Gas. Arrow Press Student Publication No. 7. Watford: Arrow Press Ltd., 1954. Pp. 12. 5*s.*

This publication has been prepared by a special correspondent of the *Gas Times* in collaboration with the Power-Gas Corporation Ltd. Although primarily written for students, it should be of much interest to anyone desiring to obtain knowledge of the processes and reactions involved in synthesis gas manufacture.

Composition and Properties of Oil Well Drilling Fluids. Walter F. Rogers. Houston: Gulf Publishing Co., 1953. Pp. x + 676.

Pipe Line Corrosion and Cathodic Protection. Marshal E. Parker. Houston: Gulf Publishing Co., 1954. Pp. vi + 104.

Gasification of Hydrocarbons. Jerome J. Morgan. New York: Moore Publishing Co., 1953. Pp. 180.

British Standards:

BS 411: 1954. Circular Saws for Woodworking and their Attachment. Pp. 17. 3*s.* net, post free.

BS 1054: 1954. Engineers' Comparators for External Measurement. Pp. 10. 2*s.* 6*d.* net, post free.

BS 2490: 1954. Waterproof Drawing Inks. Pp. 13. 3*s.* net, post free.

BS 2518: 1954. Rotary Form-Relieved Gear Cutters. Pp. 27. 7*s.* 6*d.* net, post free.

BS 2051: 1954. Steel Compression Pipe Fittings for Engineering Purposes. Pt. 3. Pp. 18. 3*s.* 6*d.* net, post free.

BS 2051: 1954. Steel Nipple Pipe Fittings (for Brazing). Unified Threads and Unified Hexagons. Pt. 4. Pp. 21. 4*s.* net, post free.

BS 2517: 1954. Definitions for Use in Mechanical Engineering. Pp. 28. 6*s.* net, post free.

ABSTRACTS

	PAGE
OILFIELD EXPLORATION AND EXPLOITATION	
Geology	37 A
Geophysics and Geochemical Prospecting	39 A
Drilling	40 A
Production	40 A
Oilfield Development	42 A
TRANSPORT AND STORAGE	43 A
REFINERY OPERATIONS	
Refineries and Auxiliary Refinery Plant	45 A
Distillation	46 A
Absorption and Adsorption	46 A
Solvent Extraction and Dewaxing	47 A
Cracking	47 A
Hydrogenation	48 A
Alkylation	48 A
Chemical and Physical Refining	48 A
Special Processes	48 A
Metering and Control	48 A
PRODUCTS	
Chemistry and Physics	49 A
Analysis and Testing	50 A
Gas	52 A
Engine Fuels	52 A
Gas Oil and Fuel Oil	52 A
Lubricants	52 A
Bitumen, Asphalt, and Tar	54 A
Special Hydrocarbon Products	54 A
Derived Chemical Products	55 A
Coal, Shale, and Peat	56 A
CORROSION	56 A
ENGINES AND AUTOMOTIVE EQUIPMENT	56 A
SAFETY PRECAUTIONS	56 A
MISCELLANEOUS	57 A
BOOK REVIEWS	57 A
ADDITIONS TO THE LIBRARY	58 A

AUTHOR INDEX

The numbers refer to Abstract Numbers

Adams, E., 338
Adcock, C. M., 329
Albert, P., 322
Alexander, L. G., 405
Allen, B. W., 396
Altorfer, H. A., 357
Ambrose, T. D., 462
Amick, E. H., 372
Angebrandt, F. M., 310
Askey, W. F., 407
Austin, B. J., 391

Bailey, J. M., 515
Barker, K., 464
Barnes, B. E., 360
Barnes, R. S., 482
Barrett, J. P., 514
Bart, J. C., 411
Bates, C. C., 362
Bearden, W. G., 321
Beck, K-G., 453
Berg, C., 410
Berkeley, F. D., 388
Blakey, B. C., 437
Blücher, F., 524
Boliman, G. H., 516
Booth, W. M., 310
Boyd, D. M., 425
Brase, B., 415
Brien, E. B., 366, 506
Brons, F., 324
Brooke, M., 384
Brooks, B. T., 506
Brooks, W. B., 513
Brown, L. S., 378
Bucholz, H. H., 497
Burke, W. F., 369

Cafcas, T. H., 482
Cameron, A., 475
Campbell, J. M., 459
Cary, J. R., 387
Chamberlain, C. A., 516
Chaumet, P., 322
Clare, H., 465
Clark, G. H., 528
Clay, T. W., 369
Collins, R. E., 320
Coogan, F. J., 391
Coppa-Zuccari, G., 494
Corbett, P. F., 464
Corrigan, T. E., 427
Crantz, R., 490
Crawford, P. B., 320
Crews, S. H., 297
Crico, A., 373
Criddle, D. W., 485
Crosby, E. S., 391

Dalla Lana, I., 431
Dean, L. E., 408
Dean, R. R., 395
Debyser, J., 284
Dedman, S. W., 407
Deile, L., 446
Deterding, J. H., 451
Dickie, R. K., 329
Dietsch, C., 501
Disney, R. W., 289
Drinkwater, J. W., 455
Drzewiecki, J., 522
Duff, D. M., 332
Dummett, G. A., 394
Dunning, H. N., 326
Dupouy-Camet, J., 346
Dyson, A., 451

Eaton, C. D., 391
Eby, L. T., 436
Egloff, G., 412, 505
Ellis, E. G., 483
Everest, T. F., 477
Everett, R., 292

Foster, A. L., 386
Freshwater, D. C., 396, 399, 419, 421

Gardner, F. J., 293, 334
Garner, F. H., 512
Georgi, C. W., 471
Gibbon, A., 299
Gibinski, S., 409
Gilliland, R., 425
Girelli, A., 448
Gladkikh, M. A., 500
Glogoczowski, J. J., 307
Godfrey, D., 515
Govier, G. W., 431
Grindrod, J., 361
Guénoche, H., 434
Guthrie, V. B., 363

Hale, A. R., 512
Hall, D. S., 408
Harber, H., 478
Harris, J. J., 426
Hart, W., 445
Harvey, R. J., 336
Hatfield, R., 391
Hawkins, H., 405
Hazebrock, P., 324
Headington, C. R., 456
Heinemann, H., 411
Hemfort, H., 460
Hendricks, H. L., 468
Hern, R., 364
Hillinckx, L. J., 511
Hills, A. T., 371
Holland, H., 356
Hoog, H., 428
Horstman, W. G., 350
Hughen, F. L., 359

Insall, A. J., 455

Johnson, A. L., 398
Johnson, F. B., 406
Jones, M. C. K., 416
Jones, W. A., 401
Jouy, M., 434
Jullian, Y., 285
Junge, C. H., 481
Jurkiewicz, J., 429

Karpinski, T., 316
Kennedy, W. L., 349
Kilpatrick, M. O., 408
King, R. O., 452
Kirk, J. C., 469
Kirk, R. S., 402
Klanjscek, D., 327
Kneule, F., 461
Kontrec, S., 327
Krebill, F. K., 336
Kul'pina, E. P., 503
Kwaciszewska, A., 454

Lanum, W. J., 309
Lawrence, A. S. C., 437
Lester, C. B., 351–3
Lewis, R. H., 492
Loofbourow, R. L., 367

McCann, W. L., 319
McCaslin, J. C., 291, 294–5
McClain, D. S., 288
McClure, D. J., 445
McEwen, C. R., 313
McGilvray, A., 344
Maier, A. F., 385
Mallison, H., 495
Malschaert, F. P., 527
Martin, M., 348
Matthews, C. S., 324
Meerbott, W. K., 413
Michaud, M., 435
Miller, L. S., 335
Mitchell, R. A., 507
Molinero, R., 317
Monnot, G., 425
Morrisey, N. S., 305
Musgrave, F. F., 473

Nelson, E. W., 469
Newberg, A. H., 514
Nielsen, R. F., 323
Noone, M., 368
Nüssel, H., 489

Oblad, A. G., 411
Ogrodnik, A., 397
Opdenberg, W., 460
Overcash, R. L., 445

Paille, E. B., 391
Paleari, C., 448
Parker, I. M., 350
Parker, M. E., 355
Pasche, A. T., 358
Pass, F., 433
Patterson, A. C., 416
Patton, J. L., 287
Peck, R. A., 493
Perrin, G. H., 498
Petrov, Yu. V., 503
Phillips, C., 391
Pingrey, G. D., 439
Pluta, J. S., 308
Poll, H., 453
Pollak, C., 526
Poiny, W. J., 479
Pratt, H. R. C., 377, 400

Quon, D., 431

Rabinowicz, E., 466
Radcliffe, A., 465
Ragatz, E. G., 390
Randi, M., 444
Rase, H. F., 402
Ratelband, J. B., 382
Raudenbusch, H., 488
Raymond, L., 472
Resen, F. L., 375, 430
Rex, H. M., 493
Richardson, C. B. W., 457
Rick, A. W., 491
Rintoul, W. T., 339
Rippie, C. W., 418
Rohlich, G. A., 391
Ross, T. K., 376
Ruchhoff, C. C., 391
Rudershausen, C. G., 438
Rummerfield, B. F., 308
Runge, F., 414

Salomon, T., 496
Salz, L., 476
Sandler, S., 452
Sarida, V., 327
Schram, A., 433
Schuster, F., 458
Sherwood, P. W., 509
Sierek, C., 318
Siniramed, C., 448
Sittig, M., 508
Smalling, J. W., 407
Smith, C. W., 330
Smith, D. T., 303
Smith, J. D., 468
Socolofsky, J. F., 472
Spann, R. E., 343
Speed, K. W., 408
Stanley, M. E., 439
Stoker, W. R., 499
Straley, H. W., III, 288
Stripling, A. A., 304
Strom, R., 492
Strong, E. R., 391
Sturm, R. G., 479

Tannhauser, J. U., 302
Temme, T., 487
Terres, E., 432
Thompson, C. N., 499
Thornton, D. P., 417, 510
Tinel, G., 502
Tong, R. W., 484
Townend, D. T. A., 440
Turnbull, H., 391

Utzmann, R., 306

van Winkle, M., 393

Walidiuda, A., 520
Watson, C. C., 438
Watt, J. J., 486
Weber, G., 404
Welborn, J. Y., 492
Wenger, W. J., 309
Widmaier, O., 441
Wierschowski, T., 325
Williams, A. R., 447
Wilsey, L. B., 321
Wilson, C. O., 337
Wilson, N. G., 374
Withers, J. G., 486
Wojnar, K., 312
Wood, R. G., 406

Yarham, O. L., 470

Zalkin, C. L., 325
Zandona, O. J., 418
Zelen, J. T., 405
Zepf, K., 414
Zerbe, C., 530

OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

284. Recent sedimentation and the search for oil. J. Debyser. *Rev. Inst. franç. Pétrole*, 1954, **9** (10), 543–61.—A study of recent sediments, their nature and distribution, aids in the understanding of ancient sediments. However, the period over which the former can be studied is very short compared with geological time, and so the data may not be representative in all respects of old sediments. Consequently some restrictions must be placed on the application of the principle of uniformity. An attempt is made to throw light on oil formation via oceanographical data. The organic matter in sediments is linked with the environment of deposition, and undergoes some biochemical changes. Hydrocarbons have

been detected in recent sediments, when the samples are suitably treated. The facies favourable for oil formation appears to be the muds of the continental shelf, and the formation is a result of normal sedimentary processes, not of catastrophic events.

An extensive bibliography is appended. G. D. H.

285. Extraordinary reunion of the Association Française des Techniciens du Pétrole. Y. Jullian *et al.* *Bull. Ass. franç. Tech. Pétrole*, 30.9.54, 409–39.—Notes are given on a series of visits made by the geological and exploration section in Oct. 1953, to Baden, Switzerland, and Haute-Alsace.

W. Maschek deals with Zienken 1 and Weinstetten 1, 2 wells drilled in search of oil in the region of Mullheim–Buggingen. O. Wittmann describes the geology of the area between Mullheim and Bâle. The Bâle–Chateau de Pfeffingen–Ettingen–Hoffstetten–Fluh, and Fluh–Oltingue–Jura de Ferrette–Hirtzbach–Mulhouse sectors are described by Prof. Vonderschmitt and J. Blumenroeder, respectively, and the latter also deals with the Mulhouse–Fosse de Dannemarie–pre-Vosgian hills and fracture field of Lauw–Vieil-Armand–Staffelfelden and fracture field of Rouffach.

A number of maps and sections are included. G. D. H.

286. Association News. Anon. *Nafta (Krakow)*, 1954, **10**, 47–8.—Conference on 15.12.53 asked for Government help to maintain and increase the rate of geological prospecting. Conference on 18.12.53 asked the Association to classify and standardize power equipment for auxiliary work. M. S.

287. South-Eastern states hold promise for tomorrow. J. L. Patton. *Oil Gas J.*, 9.8.54, **53** (14), 160.—5 oilfields have been discovered in the SE. states of the U.S.A., comprising S. Alabama and Georgia, and Florida. The main structural features of the area can be divided into 7 units, as follows: the Ocala Uplift, the S. Florida embayment, the Hatchetigbee anticline and the Jackson fault, the SW. Georgia embayment, the Decatur arch, the SE. Georgia basin, and the Mississippi Interior salt dome basin. Total number of producing wells in the area is 59, and exploration is being actively carried out. Forecasts of future discoveries are cautiously optimistic.

C. A. F.

288. Petroleum possibilities in Georgia. D. S. McClain and H. W. Straley III. *Petrol. Engr*, March 1954, **26** (3), B38.—Drilling in S. Georgia, N. Florida, and SE. Alabama has produced much needed geological information. Surface geology is worthless, and geophysical information is either wanting or inadequate to supply a complete idea of conditions. A detailed stratigraphic column is in preparation. Structural features include the Central Georgia Uplift and the Decatur Arch, between them lying the Apalachicola Embayment. Local structure, however, is almost unknown. Near the Decatur Arch there are faults similar to those in the Gilberton field of Alabama. Conditions necessary for stratigraphic traps are present, and compaction folds should be common. Only the Selma–Eutaw and Ocala formations appear likely as source rocks whilst sands of the Tuscaloosa, Selma–Ripley, and higher formations fulfil the necessary porous and permeable reservoir conditions. Numerous oil tests have been drilled, many of them being inconclusive because of the lack of stratigraphical detail. Maps and sections are included.

W. S. R.

289. Anadarko Basin's east flank promising. R. W. Disney. *World Oil*, Jan. 1954, **138** (1), 77.—Gas condensate and oil production from the Simpson Group (Ordovician) calls for a closer study of the geology of the area, especially that south of Oklahoma City. Multiple source beds in the east, and also unconformities and porous carrier beds, indicate that the eastern fringe of the Anadarko Basin has high oil possibilities. Similarly reservoir rocks and structures are favourable for oil accumulation. Anticlines, noses, and structural terraces associated with faults are widespread in the area. Favourable stratigraphic conditions exist in the Deese sands, Cherokee Group, Hunton 1st, and Viola 1st and dolomite. Article discusses in general the geology of the area, and includes many maps and diagrams. W. S. R.

290. Wildcat tests gas. Anon. *Oil Gas J.*, 9.8.54, **53** (14), 79.—1 Toyah Unit in the Delaware Basin, 10 miles W. of Pico, Texas, on test of the Ellenburger from 14,787 to 88 ft produced 5000 M.c.f. dry gas/day. Gas is also reported from the Devonian. Bottom-hole temp was 318° F. C. A. F.

291. Order is emerging out of chaos. J. C. McCaslin. *Oil Gas J.*, 16.8.54, **53** (15), 188.—Stratigraphical nomenclature for the Williston Basin of N. Dakota, hitherto confused in the course of the accumulation of much subsurface information, has now been simplified by the N. Dakota Geological Soc. A summary of this work is given, and 11 formations are cited as oil-productive, ranging from Ordovician to Cretaceous.

C. A. F.

292. Stratigraphic problems of Warrior Basin. R. Everett. *Oil Gas J.*, 2.8.54, **53** (13), 95.—Between Feb. 1952 and April 1954 51 new fields were discovered in the Warrior Basin of Mississippi and Alabama. The structure of the area is complex, but accumulations are believed to be partly due to structural influences. There are stratigraphical problems in the basin, particularly in the Chester series, and these are discussed. Most of the new discoveries are gas fields, but the small production so far does not permit accurate ultimate recovery predictions. A structure contour map of the top of the Mississippian and an E–W section of the Chester rocks are included. C. A. F.

293. D–J– bright star of the west. F. J. Gardner. *Oil Gas J.*, 30.8.54, **53** (17), 129.—Exploration for new fields in the Denver–Julesburg basin in the Rocky Mountain area of the U.S.A. has been very successfu[1]. Over 50 discoveries have been made, and further important finds are anticipated. Most of the fields produce from the Upper Cretaceous Dakota D and G sands and from the Lower Cretaceous J sand. 2 fields (Black Hollow and Keota) found Permian Lyons sand production. Cretaceous producing depths range from 3500 (eastern flank) to 8400 ft (SE. Wyoming). Permian pay is below 8000 ft. C. A. F.

294. Simpson group jumps into Oklahoma news. J. C. McCaslin. *Oil Gas J.*, 16.8.54, **53** (15), 187.—Results of deep drilling for Ordovician Simpson production in the Bradley area of SW. Oklahoma are reported. Most important development is the discovery of Oklahoma's deepest production at 1 Steve, 1½ miles SE. of Bradley, which flowed 411 b.d. of 49.5° oil from the Oil Creek at 13,735–13,804 ft. The Bradley field, which lies in the SE. embayment of the Anadarko Basin, was discovered in 1953, and production has been found in several Simpson zones. There are 3 structural units: Bradley, SE., and NE. Bradley. Prospects for developing Simpson production in this part of the Anadarko basin are excellent, but will require very deep drilling.

C. A. F.

295. Wyoming leads in Rockies interest. J. C. McCaslin. *Oil Gas J.*, 13.9.54, **53** (19), 184.—3 important discoveries have recently been made in the Wind River, Big Horn, and Green River basins of Wyoming. The major discovery is in the Wind River basin, where the Grieve Unit well on the eastern side of the basin found oil in a Cretaceous sand at 6768–6780 ft at 1215 b.d. of *ca* 36° oil. The well is SW. of the West Poison Spider field, which has Cretaceous production. The fields of the area occur in small separate closures superimposed on a major asymmetrical fold trending NW. to SE. The Big Horn discovery is 1 Big Polecat Unit in Park County, which found 470 b.d. of oil from 125 ft of Tensleep sand; the well was sited after seismic work. Most of the fields in the basin occur on satellite anticlines around the rim. The Green River basin is the least explored basin in Wyoming, and is the most promising. The discovery, Canyon Creek

Unit in Sweetwater County, found gas at 10,000 M.c.f/day from approx 5500 ft. Pay is probably Mesaverde. C. A. F.

296. 3 zones produce in Oregon Basin. B. W. Allen. *Petrol. Engr*, Feb. 1954, **26** (2), B43.—The Oregon Basin field lies on the crest of a north-trending anticline in the west of the Big Horn Basin. 3 principal producing horizons are Embar 1st (Perm), Tensleep (Penn), and Madison 1st (Miss). Surface structure is indicated by the Mesa Verde (U.Cret) and the Frontier 1st (U.Cret). High-angled tensional and shear fractures are also indicated which penetrate to the Embar–Tensleep zone. Faulting appears to be of the same age as the folding which produced the Oregon anticline. Subsurface structure indicates an asymmetrical fold. Characteristic of the Big Horn Basin, the steeper slope is on the west side. The anticline has 2 domes with independent closures of 700 and 900 ft. The stratigraphy of the area from Cretaceous to Cambrian is described in detail, together with the producing horizon characteristics. W. S. R.

297. The Big Horn, basin of basins. S. H. Crews. *Petrol. Engr*, Feb. 1954, **26** (2), B32.—Discovery well in the Bonzana field was drilled in 1951 and completed in the Tensleep at 2500 ft. Other fields now in operation include: (1) Grass Creek field—discovered in 1914—produced 44° oil from the Frontier sand (Cret). Oil is now also produced from Embar, Tensleep, and Curtis formations; (2) Oregon Basin—2 separate domes on the same anticlinal axis—produces from the Embar Tensleep and Madison formations; (3) Cottonwood and North Shoshone fields are stratigraphic traps. Pressure maintenance is operated in the Elk Basin field, and is under way in the Oregon Basin. W. S. R.

298. Pemex strike made. Anon. *Oil Gas J.*, 13.9.54, **53** (19), 100.—The discovery of a major field at Tecolutla along the old Golden Lane trend of Mexico is reported. The discovery well, Miguel Hidalgo 1, *ca* 30 miles SE. of Poza Rica, produced on test 3000 b.d. of 31° oil. Oil reserves in Mexico are estimated at 2,427,000,000 brl, compared with 2,261,000,000 brl in 1953 and 1,058,000,000 brl in 1946. C. A. F.

299. Cuban hopes centre on a wildcat. A. Gibbon. *World Oil*, March 1954, **138** (4), 248.—A wildcat is being drilled in the Dos Estrellas concession. Location is on the east limb of the Jatibanco–Ciego de Avila–Zaza basin, NE. of the Trinidad mountains. The Jarahueca oil field is also located on the NW. limb of this basin. It is postulated that the sedimentary section, which may contain oil accumulations, is less thick than in the Zapata Basin. To date, Cuban production has been limited to serpentine and serpentine contacts, however, potential sedimentary reservoirs, including the Aptychus 1st (L. Cret) and younger ssts, could exist at less than 7500 ft. W. S. R.

300. Australian oil fever-high as exploration continues. Anon. *Oil Gas J.*, 6.9.54, **53** (18), 75.—Plans for further exploration in Australia include drilling at Cape Range and further drilling at Rough Range in the Exmouth Gulf area. The Cape Range structure is appreciably larger than Rough Range, and is thought to have the best prospects in Australia. Rough Range 2, *ca* 3000 ft west of the discovery, was abandoned as dry; salt water was found in the No. 1 pay sand. C. A. F.

301. German discovery. Anon. *Oil Gas J.*, 13.9.54, **53** (19), 103.—Oil has been found in the Bavarian foothills, which may prove a new oil province in W. Germany. The discovery, Ampting 4, 40 miles E. of Munich, found oil-bearing basal Tertiary sand at 5900 ft, and on test produced *ca* 60 tons (407 brl)/day of 20·5° oil. Offset wells are planned. Natural gas was previously found by Ampting 2 and 3. C. A. F.

302. Oil in Greece. J. U. Tannhauser. *World Oil*, Jan. 1954, **138** (1), 230.—It is believed that potential oil-bearing areas of the Adriatic Basin extend into coastal parts of Greece. Favourable areas also occur in NE. Greece, in W. Thrace. Major oil-bearing basins are unlikely, due to the mountainous character of the Greek peninsula, but minor basins exist which have fair oil prospects. One group of basins is located along the Greek Ionian coast in Epirus, Zante, and the western plains of the Peloponnesian peninsula. On Zante seepages have been reported since 484 B.C. Wells drilled to 300 ft yielded an initial 300 b.d., but were later abandoned. Tertiary beds hold promise in Pyrgos–Olympia, where seepages and asphaltic deposits are reported. The other group of basins—in W. Thrace—are probably the most promising prospects. Small structures are present. Seepages are reported from exposures of Eocene basal conglomerate near its contact with the Nummilitic 1st. Elsewhere this 1st is asphaltic at its contact with volcanic rocks. Miocene formations also yield seepages. W. S. R.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

303. Geophysical methods of oil prospecting. Pt 1. D. Taylor Smith. *Petroleum, Lond.*, 1954, **17** (10), 362–4, 371.—This is the first in a series of articles intended to give a picture of methods of geophysical prospecting in current use. Descriptions are given of gravitational, magnetic, seismic, and electrical methods. Limitations of electrical methods are given. J. B. S.

304. Locating zones of fracture. A. A. Stripling. *Petrol. Engr*, Feb. 1954, **26** (2), B85.—Magnetic iron oxide mixed with Hydrafrac gel has been used as a tracer to mark fractures in the Spraberry trend of W. Texas. This marking is detected by a new magnetic susceptibility logging tool. Comparison of logs made before and after Hydrafrac treatment delineates fractured zones. The tool also records an induction conductivity log simultaneously with the magnetic log. Comparison of resistivities discloses zones in which resistivity has been increased by the Hydrafrac. This is interpreted as indicating zones in which conductive formation water has been displaced by non-conductive Hydrafrac fluids, and is therefore a qualitative measurement of permeability. Article includes typical logs. W. S. R.

305. This mobile magnetometer accurately maps these contacts. N. S. Morrisey. *Oil Gas J.*, 13.9.54, **53** (19), 120.—A mobile form of magnetometer, the MoMag, is briefly described. It is truck-mounted and was originally developed for the mining industry, but it can be used to map both regional and local anomalies of interest in oil exploration. Under favourable conditions cost is *ca* $5 per profile mile. The magnetometer is mounted on a specially designed 4-wheel drive truck; electronically controlled servo-systems automatically orient the magnetic detector to give max intensity readings. The recorder graphs the magnetic data continuously and is coupled with the vehicle drive for longitudinal scaling. C. A. F.

306. Scale model studies in connexion with electrical prospecting and telluric currents. R. Utzmann. *Bull. Ass. franç. Tech. Pétrole*, 30.9.54, 347–407.—The theory underlying earth resistivity measurements, and the use of telluric currents in geophysical prospecting is given and certain fundamental equations are derived. The interpretation of field results is discussed. This may involve mathematical integration where feasible, or the use of relaxation methods; alternatively, networks of resistances or model experiments may be used. The construction and use of models is then described in detail, attention being drawn to suitable materials, the necessary electrical equipment, and the sources of error. A series of curves are given for a few simple structures. G. D. H.

307. New geochemical crude and gasbearing indicator. J. J. Glogoczowski. *Nafta (Krakow)*, 1954, **10**, 2–6.—During investigations of "bitumen index" it has been observed that

CCl_4 extracts show large quantities of sulphur. Reduction of $SO_4^=$ by bacteria in presence of hydrocarbons is the clue to this. H_2S and $S^=$ are also found. They are later converted to S by organic acids, CO_2, and water. Formations above a hydrocarbon reservoir are also acted upon by CH_4, provided pH is suitable. Thus the ratio $SO_4^=$ to S or S + $S^=$ can be used as an indication of hydrocarbon. Analytically the difficulty centred around the absence of a method for a quick sulphur determination. Polarography was applied, later another way was evolved. A paper by M. I. Gerber and A. D. Shusharin served as theoretical basis. Repeatability was very good. The extract was dissolved in C_6H_6 and treated with $NaO_2CCH_3 + HO_2CCH_3 + HOH_2CCH_3$ (in excess). Sulphur "wave" appears at −0·6 volts. Accuracy is *ca* 0·005 mg/ml. Experiments in the field show max of S at the depth of 550–750 m, whilst inorganic salts reach max at 460–490 m. These are mostly Cl^-.$SO_4^=$ is expected to reach max 500 m near a stratum of anhydrite. Bitumens reach max at 620–750 m, but their estimation excludes gases.

M. S.

308. Texas poses tough geophysical problems. J. S. Pluta and B. F. Rummerfield. *Oil Gas J.*, 30.8.54, **53** (17), 70.—The problems of obtaining usable seismic reflection data in various areas of Texas and the ways in which they are being overcome are described. In the Gulf coast province the quality of the data is generally good, but interpretation is difficult. Specialized equipment involving high costs is necessary for offshore work. In the Edwards Plateau area results were formerly unsatisfactory; refraction methods are difficult to interpret, but the use of multiple shot holes and geophones has improved the position. In the northern basins of the Palo Duro area record quality is generally good, but multiple reflections are a serious problem. In the Dalhart basin there are many high and low velocity layers causing considerable errors in interpretation. In the Delaware basin, where results were formerly unsatisfactory, improvements have been made using various techniques, including pattern shooting and multiple geophones. C. A. F.

309. Characteristics of crude oils from Big Horn Basin fields. W. J. Wenger and W. J. Lanum. *Petrol. Engr*, Feb. 1954, **26** (2), A52.—Summaries of analytical data for 103 oils from the Big Horn Basin are shown. Analysis was done along USBM methods. Oils analysed are from Cretaceous, Trias, Permian, and Mississippian time periods. All low sulphur oils were produced from Cretaceous formations, whilst those oils with a sulphur content greater than 0·5% were produced from formations older than Cretaceous. Further correlations between oil types and geological source are suggested. Similar correlations have been made in neighbouring areas of the Rocky Mountains. Article includes tabulated results of the analysis. W. S. R.

DRILLING

310. Big drill collars are drilling straighter hole. W. M. Booth and F. M. Angebrandt. *Oil Gas J.*, 26.7.54, **53** (12), 216.—High costs resulting from crooked-hole problems have deterred drilling in the foothills region of W. Canada. Formations dip from 10° to 64°, and generally beds from 0 to 7000 ft have rapidly changing and unpredictable dips, whilst those for 7000–10,000 ft have lower and more uniform dips. Experiments have been carried out to improve penetration rate and hole control in the Jumping Pound field, and the results of these are given. The use of 11¼-inch drill collars in 12¼-inch hole has shown improvements, and it is indicated that still larger collars could be tried out, as well as some system of stabilizers in conjunction with the large collars.

C. A. F.

311. Dual logging unit perfected. Anon. *Oil Gas J.*, 26.7.54, **53** (12), 73.—A new logging unit which automatically analyses gas in drilling mud and records the depth of hole and rate of penetration has been developed in the U.S.A. Depth and drilling rate are recorded on a strip chart by means of an electrical switch connected to a Geograph on the rig floor; the switch "kicks" the chart for every foot drilled. The gas detector is a form of Wheatstone bridge consisting of a detector filament wire, galvanometer, and balancing potentiometer. C. A. F.

312. Coring by rotary drilling. K. Wojnar. *Nafta (Krakow)*, 1954, **10**, 6–9.—Several coring bits are described, with diagrams and method of operation given. Best corer is one which can be put through mud pipes. In 30 minutes a core can be obtained from a depth of 1800 m. M. S.

313. Drilling with nitrogen and micro-hole drilling. C. R. McEwen. *J. Petrol. Tech.*, Aug. 1954, **6** (8), 10–11.—In 1938 2 wells were drilled at Signal Hill, using natural gas as the circulating medium. The use of nitrogen (Grable system) removes fire risks. Return circulation through a small annulus in a double-concentric drill string reduces the circulation rate. With 8⅝-inch casing set at 3842 ft and 888 ft of 7⅞-inch hole to drill for completion nitrogen to charge the system at 425 p.s.i. costs $220, and allowing 100% make-up every day (which is excessive) the cost would be $1320. The use of nitrogen avoids plugging pores or fractures in low pressure oil sands, avoids contamination, lost circulation, and cleaning out for production. There is no harmful water intrusion or physico-chemical action, and cores and cuttings are not contaminated. A micro-hole derrick has been designed to handle 6000 ft of drill pipe (1¼-inch upset tubing) for drilling 2¾-inch hole. In drilling 20,000 ft of hole average bit life was 240 ft and average penetration rate 14 ft/hr. The drill-fluid system requires 9 brl/1000 ft, the site is 28 ft by 60 ft; 2 men can lay down and make up pipe for 3000–4000 ft. Some types of down-hole surveys can be used, but not others because of size limitations. A 3000 ft hole might require 14 days, and cost $2.74/ft, covering logging, mud, surveys, surface casing, cement, etc. Holes deeper than 4000 ft may have to be 4 inches dia. G. D. H.

314. Rig mobility equipment. Anon. *Brit. Petrol. Equipm. News*, 1954, **4** (1), 49–50.—In order to facilitate the erection of rigs at different points in an oilfield at Basra, the rig is split into derrick plus sub-structure, and machinery. Difficulties to be overcome in transporting the sections are given. One caterpillar tractor is required to drag the bogies supporting the 2 rig units. The time of such an operation is reduced from days to hours by using mobility equipment.

E. A. G. H.

315. Underwater oil search in the Persian Gulf. Anon. *Fluid Handl.*, 1954, **58**, 292.—A brief account of a new, entirely self-contained movable drilling rig is given.

D. J. S.

316. Estimation of sulphate contents in drilling samples. T. Karpinski. *Bull. Polish Inst. Petrol.*, 1954, **4**, 1 (Suppl. to *Nafta (Krakow)*, 1954, **10**).—Sulphates in rocks are reduced by volatile hydrocarbons coming from below. In the field a fast method was required. First method used was the polarographic estimation of Ba^{2+} before and after addition of soln containing $SO_4^=$. Second was electrolytic and ordinary titration. All were too lengthy. Successful results were obtained by use of colorimetric measurement of ppte formed by $BaCl_2$ with soln tested. Standardized conditions were necessary, *e.g.* pH had to be maintained with NaOAc and HOAc at fixed concn. Glycerol (at 33% of total vol) stabilizes the ppte. Procedure was standardized, and test takes under 15 minutes. Errors are *ca* 8% at concn of $SO_4^= < 0{\cdot}002$ N.

M. S.

PRODUCTION

317. Summary of the documentation on production material and methods. R. Molinero. *Rev. Inst. franç. Pétrole*, 1954, **9** (10), 573–9.—A short summary is given of the principal

articles published in 1953 on well equipment, pumping, gas lift, separation, storage, and automatic control. G. D. H.

318. Influence of number and length of piston strokes on efficiency of well bottom pump. C. Sierek. *Nafta (Krakow)*, 1954, **10**, 46–7.—Although mechanical output of a pump is the product of number of strokes per unit time, stroke of piston, and its cross-section, it also depends on sand porosity, gases in crude, and, obviously, leaks. Best results are obtained with long, not very frequent strokes. These allow crude to fill the cyl as well as cut down the percentage of loss due to " dead " space and elastic elongations of rod. Back pressure due to liq above pump must be adjusted by rate of production to an optimum. On slowing down the pump more energy is saved than lost due to longer operation. Often a pump has to run longer in any case because it is used to balance another unit. Power consumption falls to a larger degree than number of strokes/hr. Total production often remains as before. M. S.

319. Fracturing rejuvenates a veteran field. W. L. McCann. *Oil Gas J.*, 16.8.54, **53** (15), 136.—Fracturing procedures in the Caddo field of Louisiana are described. The field was discovered in 1905, and *ca* 7500 wells had been drilled up to 1953, producing from numerous sand and limestone reservoirs in the Cretaceous. Fracturing has been applied to the Annona chalk reservoir, which has a porosity of 25–28% and a permeability of *ca* 1 mD. Until 1953 production from this zone was obtained only in parts of the field where it showed well-developed fractures. Acidizing was only moderately successful in stimulating productivity, but later fracturing procedures using heavy oil mixed with sand as propping agent have proved very successful, and there has been a marked revival in drilling operations. C. A. F.

320. Estimated effect of vertical fractures on secondary recovery. P. B. Crawford and R. E. Collins. *J. Petrol. Tech.*, Aug. 1954, **6** (8), AIMME Tech. Paper No. 3879, 41–5.—Potentiometric model studies have been made of vertically fractured reservoirs, the fracture being represented by a strip of copper soldered to the well. The length and direction of the fracture were varied. The areal sweep efficiencies for line-drive patterns were determined. The efficiency for the fracture-free system was 70·6%. When the fracture was parallel to the direction of flood, the efficiency was reduced, and approached zero at some distances. For a fracture at right-angles to the flood direction the sweep efficiency was greater in some cases than in the fracture-free syatem. Sweep efficiency depends on the length and direction of the fractures, and if the direction could be determined before initiating flooding it might be practicable to arrange the flood direction so as to get max sweep efficiency and a minimum of channelling. G. D. H.

321. Reservoir fracturing—method of oil recovery from extremely low permeability formations. L. E. Wilsey and W. G. Bearden. *J. Petrol. Tech.*, Aug. 1954, **6** (8), AIMME Tech. Paper No. 3878, 21–7.—A series of hypothetical fractured reservoir systems have been analysed, with one factor varying at a time. The horizontal fracture extending from the well was assumed to have a relatively high fluid-carrying capacity. The effects on ultimate recovery of formation permeability and thickness, fracture extent, and capacity, are presented graphically. The relationship between productivity index and cumulative production, as affected by the fracture characteristics, is shown. If there is a deeply penetrating fracture extremely low permeability reservoirs can give attractive producing rates and recoveries. Present-day techniques are believed to be capable of giving suitable fractures. Long fractures in tight formations will give relatively high producing rates over most of the well's life. Initial potential tests do not indicate the effectiveness of deeply penetrating fractures; they indicate the fracture flow capacity. G. D. H.

322. Measurement of relative permeability. P. Albert and P. Chaumet. *Rev. Inst. franç. Pétrole*, 1954, **9** (9), 483–502.—The definitions of permeability and relative permeability are given, and some general aspects of the measurement of relative permeability, such as end-effects, are discussed. Brief reference is made to the various methods available for measuring saturations, and to the different techniques employed for determining the relative permeability. More detailed reference is made to the capillary displacement and dynamic displacement methods, and reasons are given for selecting the latter for use. The mounting of a rock specimen in corite is described, together with the construction and assembly of the apparatus for making measurements by dynamic displacement, the saturations being measured electrically. The determination of the calibration curve for saturations is noted, and the results of relative permeability measurements on a piece of Vosges sandstone are presented in graphical form, together with the capillary pressure curve The results are briefly discussed with respect to their indications concerning oil recovery during production, including secondary recovery. G. D. H.

323. How to calculate unsteady state of flow. R. F. Nielsen. *Oil Gas J.*, 26.7.54, **53** (12), 253.—Because of the low compressibility of liq, equations giving flow rates as a function of boundary pressures in the porous medium are usually derived assuming zero compressibility. Field evidence, however, indicates that behaviour of fluids and accompanying pressure changes are mainly associated with liq compressibility: for example, when pressure is suddenly released from a water injection well it will show a period of back flow, and the natural water drive in many fields is due partly to the expansion of the aquifer in contact with the oil. It is therefore necessary to use equations containing the compressibility factor when analysing these conditions, and a series of such equations are presented, based on idealized radial systems assuming small and constant compressibilities. 9 refs. C. A. F.

324. Method for determination of average pressure in a bounded reservoir. C. S. Matthews, F. Brons, and P. Hazebroek. *J. Petrol. Tech.*, Aug. 1954, **6** (8), AIMME Tech. Paper No. 3876, 35–40.—Since no precise meaning can be given to the extrapolated shut-in pressure, or to that obtained after an arbitrary shut-in period, they both seem unsuitable for calculating the average pressure in a bounded reservoir. In a new approach the reservoir is first divided into the drainage volumes for each well, on the basis that at steady state the drainage volume is proportional to the well's producing rate. To calculate the average pressure in each drainage volume, a correction is applied to the extrapolated pressure (that obtained by extrapolating to infinite time the linear part of the graph of closed-in pressure against log $[\Delta t/(t+\Delta t)]$, where Δt is the closed-in time and t the production time). This correction is a function of t, and is presented in graphical form for different plan shapes of the drainage area. By volumetrically averaging the individual drainage volume pressures, the average pressure of the whole reservoir is obtained. G. D. H.

325. Science and technique in Soviet Union. C. L. Zalkin and T. Wierzchowski. *Nafta (Krakow)*, 1954, **10**, 40–2.—Mechanical spanners are described with drawings and instructions. Hydraulic pumping equipment designed in Rumania is described. M. S.

326. " Soap " washes oil out of sand. H. N. Dunning *et al.* *Oil Gas J.*, 16.8.54, **53** (15), 139.—Results of experiments designed to investigate the use of surface-active additives in increasing the efficiency of water flooding are described. Synthetic oil sands were made by mixing loose sand and volatile-free crude oil. Crude oils from various areas were used and their properties are listed. The detergents were of 3 " ionization " types and were used as received from the manufacturers. 30 g of the synthetic oil sand were centri-

fuged to determine the "displacement efficiencies" of the detergents. The relative displacement efficiencies of 0·1% soln of 64 commercial detergents are tabulated. The results of the studies emphasize the need for a more complete understanding of the fundamental principles involved in displacing petroleum from reservoir surfaces by injected fluids.
C. A. F.

327. Combating paraffin sedimentation in crude production. V. Sarida, D. Klanjscek, and S. Kontrec. *Nafta (Yugoslavia)*, 1954, **5** (8), 203–15.—The paper deals with the problem of combating paraffin sedimentation during the flow from the layer to the surface and, later, through pipelines to collectors and storage tanks. Experiences of foreign oilmen are referred to, and measures employed along this line are described, these, in the near future, are to be adopted in Yugoslavian fields. (Authors' abstract.)

328. Electrical equipment for Venezuelan oilfields. Anon. *Fluid Handl.*, Nov. 1954, **58**, 306.—Details are given of motors for well pumps and general oilfield use and of the control gear needed for them. The control gear is designed to be fully automatic, allowing pumps in remote areas to be left unattended for several weeks. A system of interlocks prevents unauthorized interference, and special tools are required for adjustments. D. J. S.

329. Oil production in the Nottinghamshire oilfields. R. K. Dickie and C. M. Adcock. *J. Inst. Petrol.*, 1954, **40**, 179–88.—Production techniques employed in these fields are described in some detail. A. R. W. B.

OILFIELD DEVELOPMENT

330. Exploration starts year at high level. C. W. Smith. *World Oil*, March 1954, **138** (4), 108.—1035 tests were recorded, 237 being commercial producers. There were 202 new oil discoveries and 35 extensions to fields. Results are tabulated by districts. W. S. R.

331. First-half completions up; year may surpass 1953. Anon. *Oil Gas J.*, 26.7.54, **53** (12), 174.—Exploratory drilling in the U.S.A. in the first 6 months of 1954 is briefly reviewed. Total completions were *ca* 10% higher than in the corresponding period of 1953. C. A. F.

332. Free world production shows small gain. D. M. Duff. *Oil Gas J.*, 26.7.54, **53** (12), 170.—Crude oil production in the free world in the first 6 months of 1954 averaged *ca* 12,174,000 b.d., an increase of 3·6% over the corresponding period of 1953. All of this increase was met by larger production from fields outside the U.S.A. Among the discoveries of interest are the heavy oil finds in Sicily, and fields in W. Australia, NE. India, and near Bordeaux in France. C. A. F.

333. Foreign production up. Anon. *Oil Gas J.*, 6.9.54, **53** (18), 78.—Crude oil production outside the U.S.A. (excluding Communist countries) during the first 6 months of 1954 averaged 5,756,900 b.d., an increase of 9·7% over the same period in 1953. In contrast U.S.A. production fell by 61,000 b.d. to average 6,452,000 b.d. Total Free World production showed an increase of 3·8% to average 12,208,500 b.d.

A table shows production for June 1954, May 1954, and June 1953, by countries. C. A. F.

334. Record year for deep drilling. F. J. Gardner. *Oil Gas J.*, 23.8.54, **53** (16), 95.—Deep drilling in the U.S.A. during the first half of 1954 is discussed; at the beginning of Aug. 345 wells had been drilled to more than 12,500 ft.

Concentration of deep drilling is in S. Louisiana, the Permian basin of W. Texas, and SE. New Mexico. The 3 deepest wells in the world are in California (21,482 ft), Wyoming (20,521 ft), and Mississippi (20,450 ft). A map shows areas in the U.S.A. where wells were projected to 13,000 ft or more (Aug. 1954), and a diagram showing annual well completions in the U.S.A. below 12,500 ft since 1949 is included. C. A. F.

335. Michigan Basin holds promise. L. S. Miller. *Petrol. Engr*, Jan. 1954, **26** (1), A35.—The geology and oil development of Michigan's S. Peninsula are described in detail. Producing formations include Rogers City–Dundee, Traverse group, Detroit River, Berea, Trenton, and Salin–Niagaran. The latter is most recent and expected to increase in importance. Current developments in the Richfield, Tuscola zones, and the Salina–Niagaran, Trenton, and Dundee–Traverse formations are described in detail. Sections and contour maps are included together with many field statistics.
W. S. R.

336. Elk Basin—the Cinderella field. R. J. Harvey and F. K. Krebill. *Petrol. Engr*, Feb. 1954, **26** (2), A37.—Original discovery well produced 43° oil at 1100–1700 ft from the Frontier sand. Since then gas has been found in the Dakota sand at 2500 ft, 30° oil in the Embar–Tensleep at 4900 ft, and 28° oil at 5150 ft in the Madison 1st. The Embar–Tensleep production is being assisted by pressure maintenance, inert gas being generated from the produced gas and injected into the crest of the structure. Bottom hole pressures have increased approx 100 p.s.i., even though production has been stepped up from 10,000 to 19,000 b.d. 16 wells have returned to flowing after being pumped prior to injection. Dominant producing mechanism in the reservoir at present is gravity drainage, and results indicate a very high recovery efficiency. Tables, graphs, etc. W. S. R.

337. New pipelines assure Denver–Julesburg expansion. C. O. Wilson. *Oil Gas J.*, 6.9.54, **53** (18), 103.—2 new big-inch lines are planned to carry oil from the Denver–Julesburg basin of Colorado and Wyoming, which is currently one of the most active drilling areas of the U.S.A. One of the pipelines, 18-inch and 20-inch pipe, will have an initial capacity of 80,000 b.d., of which 30,000 b.d. will come from Kansas fields; the other, 20-, 22-, and 24-inch pipe, will transport large quantities of oil from the basin as it becomes available. Further large-scale development in the basin is anticipated, although it has had a long productive history; the first field was Florence, discovered in 1862, which still has a small output. Present development has followed the discovery of the Gurley field in Wyoming in 1949. First discoveries were along the NE. rim of the basin, but a large part of current production comes from the more important later discoveries in the central part of the basin about Morgan County. The geology of the basin is outlined. C. A. F.

338. California takes depth records. E. Adams. *Petrol. Engr*, Jan. 1954, **26** (1), B21.—In 1945 predictions indicated that by 1955 drilling depth records would be 21,000 ft and producing depth record *ca* 18,000 ft. These predictions have proved to be true. Weeks Island is the most important deep oilfield. Some 9 wells produce from below 15,000 ft. In 1953 22 wells were drilled below 15,000 ft, 16 of them being completed for production at depths ranging from 5592 to 17,895 ft. Many new sands, all with appreciable production, have been found below 10,000 ft. Average cost for nearly 100 wells below 15,000 ft is *ca* $550,000 per well. However, many of these wells are drilled as wildcats and cost up to *ca* $740,000, 40% more than field wells. Article includes a table of all wells drilled below 15,000 ft. W. S. R.

339. Deep Eocene production established. W. T. Rintoul. *Petrol. Engr*, Feb. 1954, **26** (2), B73.—The well—in Kern County, California—completed at 17,895–733 ft flowed 119 b.d. and 1·7 M.c.f.d. gas. Tubing pressure was 2000 p.s.i., but reached 2800 p.s.i. before steadying at *ca* 2000 p.s.i. Bottom-hole temp was calculated to be 325°. W. S. R.

340. New finds may prove major Canadian field. Anon. *Petrol. Engr*, March 1954, **26** (3), B75.—In the Pembina field—SW. of Edmonton—producing wells have outlined a field 6–8 miles long by 3–4 miles wide, further drilling indicating a possibly larger field.

200 b.d. 37° API production comes from the Cardium sand. Average pay thickness is 40–45 ft. Other production is indicated in the Viking and Blairmore sands. 80-acre spacing is planned. W. S. R.

341. Mexico's busy. Anon. *World Oil*, March 1954, **138** (4), 250.—6 new field wildcats have been drilled in the structural trend and one in the Casa Blanca structure. Of the 6 completions, one at Casa Blanca was dry, 3 at San Juan were unproductive, and 2 were drilled in the Los Mangos west of Angostura. Daily average of 3 wells drilled in the Angostura structure was 1570 b.d. 15° API oil. Present findings indicate that although the Upper Cretaceous 1st is slightly porous, fracturing plays an important role in the oil accumulation. A highly complex structure and irregular distribution of first facies are indicated. The Angostura field is especially important, it being the first field found in the Vera Cruz embayment. Production is 2400 b.d. at 4400 ft. W. S. R.

342. Drilled 3 miles deep in Venezuela. Anon. *Petrol. Engr*, Jan. 1954, **26** (1), B36.—On the west shores of Lake Maracaibo, Alturitas No 1 was abandoned at 17,039 ft without finding commercial production. 2 tests of the Cretaceous 1st resulted in the recovery of a small amount of 35° oil. After abandoning the lower part of the hole, exhaustive tests were made in 7 Upper Cretaceous and Paleocene sands. All these sands were found to contain oil ranging in gravity from 18° to 22° API. Except at 12,020 ft these sands appeared to be too impermeable to allow more than a small flow at the surface. 50 cores were cut, logs were taken, and few difficulties encountered. W. S. R.

343. Middle East oil still growing. R. E. Spann. *World Oil*, March 1954, **138** (4), 241.—Highlights of 1953 were: (1) production amounted to 2,431,000 b.d.—an increase of 16% over 1952; (2) drilling exceeded the 1952 peak of 101 well completions; (3) reserves total *ca* 79,075,000,000 brl. Article includes numerous maps of concessions, etc., together with a description of the latest exploratory drilling in the whole of that area. W. S. R.

344. Oil in relation to the development of Pakistan. A. McGilvray. *Brit. Petrol. Equipm. News*, 1954, **4** (1), 36–7.—The effect of partition on the Indian Empire, and the resulting lack of indigenous oil and coal as fuel for the essentially agricultural industries of Pakistan, is discussed. The costly search for oil, and difficulties encountered in extracting it, are somewhat counterbalanced by a saving in foreign exchange and other factors. Figures are given which indicate industrial progress, due in some measure to oil development. E. A. G. H.

345. Oil has come up from Down Under. Anon. *World Oil*, March 1954, **138** (4), 240.—Exploratory efforts on the W. Coast of Australia resulted in the discovery of a high grade waxy crude at 3605–3620 ft. Discovery well produced 23 b.d., but exploratory drilling is being continued to *ca* 12,000 ft. Further exploration is being carried out by other overseas oil companies. W. S. R.

346. France's oil output hits new high. J. Dupouy-Camet. *Petrol. Engr*, March 1954, **26** (3), B25.—Largely due to the development of the Lacq field, oil production in France has steadily increased. This development has ended, but new oil finds in the Lower Cretaceous are promising. Elsewhere no important reserves have been discovered; some 6 companies operating 33 rigs in continental France. Work has been carried out in rocks ranging from Trias to Oligocene, whilst further exploration is likely in the Paleozoic of the Paris Basin and the Aquitane Basin. Activities of each company are described in detail, together with a description of the various producing fields. Diagrams, sections, and concessions are shown. W. S. R.

347. Oil off Russia's shores. Anon. *Oil Gas J.*, 13.9.54, **53** (19), 104.—Offshore oil development in the Caspian Sea is reported. There have been offshore operations in the Neftyanye Kemny field, *ca* 60 miles from the coast, which was first developed in 1949. It is reported that in 1953, 15% of Russia's production came from offshore fields: most of these are in the Caspian. Total Russian production in 1954 is expected to average *ca* 1,165,000 b.d. C. A. F.

TRANSPORT AND STORAGE

348. Pipelining of highly viscous crudes. M. Martin. *Oil Gas J.*, 29.11.54, **53** (30), 73.—Gravity and visc values of visc crudes must first be determined and then used in heat-loss formulæ in order to plan a pipeline to handle such oils. The Karge formula and modifications, and data on soil conditions were used in planning a 14-inch line of 88 miles length to carry a Baxterville crude at top operating pressure of 1000 p.s.i. using positive-displacement pumps, the oil being heated at originating station and at 8 heater stations on route. G. A. C.

349. Pressure loss in oil pipelines. W. L. Kennedy. *Pipe Line News*, Nov. 1954, **26** (11), 40–4; *Oil Gas J.*, 15.11.54, **53** (28), 232.—Data from 15 companies operating large dia pipelines are correlated by the friction factor, *f*, and a close correspondence to the data of Stanton and Pannell is maintained. Operating conditions range from Re. 40,000 to 250,000; pipe dia 12–31 inches, with both crude oil and refined products transported. B. A. F.

350. Filtering is good business. W. G. Horstman and I. M. Parker. *Oil Gas J.*, 15.11.54, **53** (28), 171.—A survey of pipeline filtering practices shows that filtering is necessary to protect pumping and metering equipment against damage and wear and to control sediment in products. Finer filtration than is usually employed is necessary for adequate protection of meters and pump seals. Corrosion control effected through inhibitor programmes using either water or oil soluble inhibitors or by dehydration of the product mimimizes quantity of sediment to be removed. G. A. C.

351. Hydraulics for pipelines—Pt III. C. B. Lester. *Pipe Line News*, Aug. 1954, **26** (8), 33–8.—Rheology of oils. B. A. F.

352. Hydraulics for pipelines. Pt IV. Flow equations. C. B. Lester. *Pipe Line News*, Sept. 1954, **26** (9), 47–50.—Poiseuille's law for laminar flow and equations for turbulent flow are derived and discussed. B. A. F.

353. Hydraulics for pipelines. Pt. V. Accuracy and the *f*-factor. C. B. Lester. *Pipe Line News*, Oct. 1954, **26** (10), 65–72.—Data of Stanton and Pannell are recommended as combining in one graph the data for all pipelining purposes. B. A. F.

354. Yellowstone products line offered terrific construction obstacles. Anon. *Pipe Line News*, Nov. 1954, **26** (11), 27–8.—Starting from Billings, Montana, the 10-inch line has 9 major and 25 minor river crossings, and reaches a max ht of 6235 ft before reaching Spokane, Washington. B. A. F.

355. Field test of polyethylene tape pipe wrap. M. E. Parker. *Pipe Line News*, 1954, **26** (11), 65–70.—The tape used on a 12-mile length of 8-inch pipe was ·008 inch thick, manufactured as a pressure-sensitive tape with a ·004 inch adhesive coating. Results indicate that the low conductance, high dielectric strength, and negligible water absorption of polyethylene make possible a new cathodic protection system using a constant, low line voltage giving freedom from interference problems and a degree of automatic regulation. B. A. F.

356. Radiographic inspection assures sound pipeline welds. H. Holland. *Oil Gas J.*, 15.11.54, **53** (28), 223.—Radiographic inspection on a total of 47,884 miles of pipeline construction from 1945 to 1953 showed that choice of correct radiographic sources and methods is most important, and that standardized qualification tests should be instituted for radiographers. Radiographic inspection should be used to effect rigid control of welds. G. A. C.

357. Design of gas pipeline blowdowns. H. A. Altorfer. *Oil Gas J.*, 13.12.54, **53** (32), 126.—Correct design size for valves of necessary mechanical strength for gas pipeline blowdowns is essential to resist reaction thrust caused by jet issuing therefrom. Size of blowdown branch can be calculated to meet exhaust time. Graphs show blowdown times for 3-, 4-, 6-, 8-, and 10-inch pipe and thrust reaction for several riser sizes and pressures. G. A. C.

358. Magnolia's new Corsicana–Beaumont line. A. T. Pasche. *Pipe Line News*, 1954, **26** (11), 29–35.—A description of the laying and operation of the 205-mile, 20-inch line. B. A. F.

359. Thorough maintenance, periodic testing. P. L. Hughon. *Oil Gas J.*, 18.10.54, **53** (24), 107.—Texas Eastern Gas Transmission Corpn's experience with power-operated valves and emergency shut-down systems indicates that proper positive operation can be had only as a result of good inspection and complete testing of equipment.

Definite schedules are set up for periodic maintenance of equipment and a valve control inspector assigned to each division of the company with primary responsibility for carrying out the programme. G. A. C.

360. Alaskan products artery nears completion. B. E. Barnes. *Oil Gas J.*, 1.11.54, **53** (26), 99.—The 8-inch line from Harries Alaska St., Fairbanks, a total of 625 miles, is virtually completed as part of defence programme. The line will have 5 pump stations and 3 storage terminals, and will deliver products of all types. Testing will take place in 1955. G. A. C.

361. Liquid sulphur deliveries. J. Grindrod. *Fluid Handl.*, Nov. 1954, **58**, 290.—A 13-ton payload tanker has been designed for the delivery by road of liq sulphur over a small radius. It is loaded by gravity and discharged by compressed air. The tanker, of mild steel, is coated internally with aluminium to prevent formation of pyrophoric iron. The tanker has steam coils fitted, and is steam jacketed at those places where the sulphur might solidify. D. J. S.

362. Gamma-radiography in oil storage installations. Pt III. C. C. Bates. *Petroleum, Lond.*, 1954, **17** (10), 357–9, 369.—Testing of storage vessels, etc., by γ radiography is both an economical and practicable proposition. A source inserted in the body of a pipeline scraper enables scraper to be located in case of trouble. Health and safety precautions are also discussed. J. B. S.

363. Operation Alpha. V. B. Guthrie. *Petrol. Process.*, 1954, **9** (10), 1583–5.—Complete with photographs and diagrams, this article concerns the storage of oil in an unused slate quarry, 65 miles from Esso's New Jersey (U.S.A.) refinery at Linden. This was the first use of an old slate quarry for the seasonal storage of refinery products, having a sectional pontoon roof covering 1¼ acres. J. H.

364. Short-cut fire-dike design. R. Hern. *Petrol. Process.*, 1954, **9** (11), 1732–7.—A quick method for mapping out tank farm lay-outs for vertical, cyl storage tanks. Lengthy calculations are avoided, and accurate results are obtained for any shape of fire wall and earth-dike arrangements on either level or sloping ground. Dike requirement calculations, constructing sizing graphs, and layout considerations are given, together with a tank farm layout example. J. H.

365. Remote automatic tank gauging. Anon. *Petrol. Process.*, 1954, **9** (11), 1742–5.—Esso Standard Oil Co employ electronic gauges on 2 installations at Everett, Mass., and Paulsboro, N.J., U.S.A. Both installations have cone and floating roof-type tanks. The foremost advantage is manpower saving, coupled with increased accuracy, decreased evaporation losses from tanks, and accident reduction. Increased tank working capacity is also possible, since the chance of "run over" or "pumping too low" is less likely with automatic than with hand gauging. Temp are obtained, with level reading, by means of an automatic switching device. J. H.

366. Simple refining equipment used to cut losses. E. B. Brien. *Petrol. Engr*, 1954, **26** (10), C51.—Up to 83% of the volatiles in fuel can be prevented from evaporating by floating a ½-inch layer of phenolic microballoons on top of storage tanks. Method of producing the layer is given. J. B. S.

367. Excavated underground storage adaptable to all types of petroleum products. R. L. Leofbourow. *Oil Gas J.*, 6.12.54, **53** (31), 115.—Underground storage for petroleum products has now been successfully used for the last 5 years. It is adaptable to storage of gases, liquefied petroleum gas and liq, and may be used in several geological environments where other types of underground storage are not suitable. Investigations are proceeding in siting and in means of sealing permeability, tables show types of large underground storage and give approx capital costs of various types. G. A. C.

368. Storage of liquids and gases. M. Noone. *Times Rev. Ind.*, 1954, **8** (95), 28–30.—Modern practice discussed, with particular reference to standardization. Use of butt-welded in place of lap-welded shells saves 1½% wt. Floating roof tanks find application where air has to be excluded from product, *e.g.* de-aerated boiler water. Economic limit of smooth Hortonspheroid type is 40,000 brl. High-pressure towns-gas holders have developed to 25 × 200 ft at 82 p.s.i. (4×10^5 ft³ at STP). LPG storage (200–250 p.s.i.) in U.S.A. limited to 30,000 gal/tank, 150,000 gal/group. Vacuum-jacketed storage of liquefied gases attracting increased attention. V. B.

369. Gas storage in a depleted reservoir. W. F. Burke and T. W. Clay. *Pipe Line News*, 1954, **26** (10), 73–8.—Approx 4 billion cu. ft. of gas are stored underground in the depleted New York City, Mississippian limestone reservoir during 8 months of the year. At the latter end of this period the compressors are used partially or wholly to cycle gas for oil production. During the remaining 4 months of the year, the 4 billion cu. ft. of gas are withdrawn from the injection and fringe wells. The fields pressure over the cycle varies from approx 1000 to 3000 p.s.i. B. A. F.

370. Aden oil harbour. Anon. *Petrol. Times*, 26.11.54, **58** (1495), 1230.—The construction at Little Aden of what is probably the largest oil harbour in the world is described. The harbour consists of a breakwater 4000 ft long and rock bunds 9000 ft long, together with 4 main jetties capable of berthing tankers of up to 32,000 dw tons. G. A. C.

371. Road transport in the oil industry. A. T. Hills. *Inst. Petrol. Rev.*, 1954, **8** (95), 211.—This subject, treated against an historical background, describes the various kinds of vehicles employed today. After mentioning the legal aspects of the subject, it is pointed out that vehicles fall into 2 main categories, those involved in moving highly inflammable materials (gasoline, etc.) and those moving heavier products (fuels and bitumens, etc.). Special kinds of each group are described, the precautions to be taken and the requirements to be met with different products being indicated. The relevance of customers' storage facilities and the importance of liaison and costing problems are mentioned. R. H.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

372. Joint research studies fractionating fundamentals. E. H. Amick. *Petrol. Engr*, 1954, **26** (10), C19–25.—Most of the published data on tray efficiencies, etc., were obtained either in small dia laboratory columns or in a large size column with only one plate. It is proposed to operate a 3-tray vapour–liq contactor, 66 inches in dia, and a dist unit with a 4-ft dia column to secure information on pressure drop, downcomer build-up, entrainment, hydraulic gradient, tray stability, pulsation, dumping, and flooding. J. B. S.

373. Design of contact catalytic reactors. A. Crico. *Chim. et Industr.*, 1954, **72**, 895–903.—Study of kinetics of heterogeneous catalysis as exemplified by reactions between gases on solid cat. A simplified general equation is derived, giving quantity of cat required for given conversion. Such equation enables lab data to be expanded to full-scale design without need of pilot-plant trials. V. B.

374. In-tank mixing of crude oil. N. G. Wilson. *Oil Gas J.*, 8.11.54, **53** (27), 165.—The problems caused by accumulation of sediment in crude oil storage tanks and gravity variations in crude streams to refinery units appear to be solved by use of in-tank mixing. Tests by Shell Pipe Line Corpn have established the economics of installing mixers and the operating procedure for best results. G. A. C.

375. Cities Service recovers 740 g.p.m. condensate. F. L. Resen. *Oil Gas J.*, 22.11.54, **53** (29), 96.—Modifications are described of the oily condensate flow system at the butadiene plant operated by Cities Service Refining Corpn at Lake Charles, La. A hold-up drum was installed which removed the greater portion of oil contained in the condensate, and a new-type pressure filter further reduced it to 0·1 p.p.m. G. A. C.

376. Plant calculations for petroleum technologists. Pt 1. Flow and measurement of fluids. T. K. Ross. *Petroleum, Lond.*, 1954, **17** (11), 395–400.—The theory is briefly stated and equations are given for evaluating friction losses. Charts for assessing friction losses in steel pipes and for equivalent lengths of fittings as a range of flow conditions are given. Instruments and equations for the measurement of flow rate based upon energy conservation are given, and some illustrative problems are worked. J. B. S.

377. Batch fractional liquid–liquid extraction. H. R. C. Pratt. *Chem Engng Sci.*, 1954, **3** (5), 189–200.—In a review of possible methods of carrying out batch fractional liq–liq extraction, analogies are made between normal and inverted operation. Reference is made to systems peculiar to the petroleum industry. E. A. G. H.

378. Metallic recuperators and industrial furnace recuperation. L. S. Brown. *J. Inst. Fuel*, Nov. 1954, **25** (166), 556.—Performance curves are given for modern recuperators used with solid, liq, or gaseous fuels. Recuperator economy is discussed, and the importance of plant layout is also considered. D. K.

379. 16th Biennial Materials of Construction Report. Anon. *Chem. Engng*, 1954, **61**, 171–234.—A comprehensive survey of materials of construction is given, detailing the applications of each. The properties of each are given in tabular form. A data chart is given which would help the engineer to narrow the choice of materials to be used. The chart does not allow for such effects as erosion, galvanic coupling, etc. Lists of a large number of metals and plastics are given, with their description or composition and more important applications. D. J. S.

380. Turbogrids: lower cost, higher efficiency. Anon. *Petrol. Engr*, 1954, **26** (10), C25–9.—Grid trays are not recommended for very low loading conditions (25–50%), but above this they give superior performance. They have 35% more capacity than the bubble cap tray, and give a continuous increase up to the load point. Grid trays operate at low pressure drops, are lower in original cost, easier to design and fabricate, and are less subject to fouling. J. B. S.

381. Cut smog while saving product. Anon. *Petrol. Process.*, 1954, **9** (11), 1731.—Standard Oil Co of California plans a new $40,000 vapour recovery system on the gasoline loading rack at Compton, U.S.A. Principal equipment includes an expanding plastic seal between the terminal loading downspout and the filling hatch on the truck, a vapour saturator, a gas holder, a 2-stage compressor, and a small absorption column. The recovery of the capital cost is estimated to be 20 years. In comparison, a flare installation costs $15,000 plus operating costs and recovers no product. J. H.

382. A new type of valve. J. B. Ratelband. *Ingenieur, 's Grav.*, 24.9.54, **66** (39), 101.—A description is given of a new type of valve operated by the radial movement of a cyl rubber diaphragm enclosing a fixed torpedo-shaped insert. The design appears to be novel and incorporates stop, check, safety, and regulating valves. The lining of valves for corrosive service represents no difficulties. Working temp and conditions are limited only by the properties of available elastomers. 35 figs and diagrams included. G. F. T. C.

383. Old Man River supplies treating water to Fortier. Anon. *Petrol. Process.*, 1954, **9** (11), 1759–60.—At Avondale, U.S.A., up to 15 million gal daily of water requiring a minimum of treatment will be pumped from the Mississippi to the Fortier petrochemical plant of the American Cyanamid Co by 2 electrically-driven centrifugal pumps. Initially, pumpage will range from 7 to 10 million gal daily at 45°–90° F. The influent is split into 2 streams, one for once-through water, the other for treated services. All effluents will be treated before being returned to the river. J. H.

384. Economics of softening cooling water. M. Brooke. *Petrol. Refin.*, 1954, **33** (10), 145–6.—Complete chemical softening of cooling water is shown to give a saving of 40% of the daily cost of unsoftened water cooling by reducing the rate of conc build up of undesirable salts. Reduction in fouling of exchangers should also improve heat transfer and reduce down time. R. D. S.

385. Design of high pressure equipment for chemical engineering processes. A. F. Maier. *Chim. et Industr.*, 1954, **72**, 645–63.—Review. Properties and compositions of H_2-resistant steels tabulated; stress distribution in equipment considered; description of manufacture of high pressure plant, with illustrated examples. Short section deals with plant for extremely high pressures (5000–50,000 atm). V. B.

386. Research blazing trails for natural gasoline. A. L. Foster. *Petrol. Engr*, 1954, **26** (10), C37–44.—Vapour-lock affects the amount of butane used in motor fuels. This is due more to fuel system of vehicle than fuel. Characteristics of bubble-caps, perforated plates, Uniflux, Koch Kaskade, Nutter, Recycle, and turbogrid trays are given.

Improved methods for H_2S removal and recovery of sulphur are also given. J. B. S.

387. Cooler-condenser wall temperatures. J. R. Cary. *Chem. Engng*, 1954, **61**, 161.—A short-cut graphical method is proposed to determine accurately the wall temp in heat exchange apparatus. The psychrometric chart is used to solve the 2 simultaneous equations obtained in the general case. If the Lewis heat balance equation is differentiated, a second method can be used which gives reasonably accurate results in many less general cases. D. J. S.

388. Air ejectors cheaper than steam. *F. D. Berkeley. Chem. Engng*, 1954, **61**, 164.—The advantages of air ejectors are listed, and detailed cost comparisons are given, which show that in many cases air ejection can be employed economically to produce vacuum in many fields where steam is currently considered to be the better medium. D. J. S.

389. The Uniflux fractionating tray. Anon. *Petrol. Engr*, 1954, **26** (10), C33–5.—Tray consists of S-members which are cheap to fabricate and light in weight. Riser area is 2 to 4 times that provided in normal bubble cap tray, hence low pressure drop. 18-ft trays have been fabricated. J. B. S.

390. The recycling tray. E. G. Ragatz. *Petrol. Engr*, 1954, **26** (10), C30–2.—Constructional details are given of a perforated plate with elaborate box-like recycling baffles. Comparative tests with a conventional bubble cap tray show the recycling tray to have an efficiency 12% higher with an absorption factor of 1·0 for the same absorption recovery potential. High tray capacities are also claimed. J. B. S.

391. Symposium on waste disposal in the petroleum industry. Various. *Ind. Engng Chem.*, Feb. 1954, **46** (2), 283–333.—9 papers cover pollution problems, analytical techniques, commercially available processes for treating industrial waste waters, and results obtained from pilot scale testing of some of the newer processes.

(1) **Taste and odour producing components in refinery gravity oil separator effluents.** C. C. Ruchhoff *et al.* 284–9.—Organic material in the effluents of 5 refineries was concentrated by adsorption on activated carbon and by liq–liq extraction. Examination of the concentrate indicated that the neutral aliphatic and aromatic hydrocarbons and the cyclic sulphur compounds were the principal source of odorous compounds.

(2) **Physical and chemical characteristics of waste water discharges.** F. J. Coogan and E. B. Paille. 290–6.—A study was made of the physical and chemical composition of the various sources of waste water from a large refinery. By mixing the acid plant and oil separator effluents with agitation, it was found possible to discharge an effluent with a residual oxygen content.

(3) **Biological growths in petroleum refinery waste waters.** E. S. Crosby *et al.* 296–300.—Lab and field tests showed most troublesome growths to be bacterial in nature. The waste component stimulating growth was the barometric condenser water. Reduced sulphur compounds, petroleum hydrocarbons, and a low level of dissolved oxygen were stimulating factors. Growths were effectively controlled by liq chlorine and sodium hypochlorite, but not by copper naphthenate or naphthenic acid.

(4) **Treatment of refinery emulsions and chemical wastes.** C. Phillips. 300–3.—Oil–water emulsions were formed in naphthenic and sulphonic acid containing waste waters, and were stabilized by finely divided precipitates of calcium and mganesium compounds. Effluent treatment consisted of acidifying, settling out of organic material, neutralizing, and clarifying with filtration of settled sludge.

(5) **Application of air flotation to refinery waste waters.** G. A. Rohlich. 304–8.—Pilot plant data indicated that max oil removal was obtained with an air input of 10 cu. ft/hr, using the recirculation method. Addition of flocculating agents gave substantial increase in oil removal. A batch, portable flotation unit was developed for preliminary evaluation.

(6) **Treatment of petrochemical wastes by superactivated sludge process.** E. R. Strong and R. Hatfield. 308–16.—Initial results of pilot scale plant indicate that by increasing the sludge rate, maintaining an unusually high concn of solids in aeration basin, and by using a high recirculation rate of treated effluent, B.O.D. could be efficiently reduced. Efficiencies of 99 and 80% for loads of 183 and 365 lb/day/100 cu. ft. of aeration volume are reported.

(7) **Biological oxidation of oil-containing waste waters.** R. J. Austin *et al.* 316–18.—Tests on pilot scale trickle filters indicated that removal of pollutants per unit of bed vol increased with feed rate but that percentage removal decreased. Recycling of a portion of filter effluent improved removal of oil and phenols, but was ineffective in improving removal of odour and B.O.D.

(8) **Reclamation of refinery effluents.** C. D. Eaton *et al.* 319–24.—Means of preparing refinery effluents for re-use are discussed. Effect of treatment on water for use in cooling water systems is examined.

(9) **Toxicity of various refinery materials to fresh water fish.** H. Turnbull *et al.* 324–33.—After permissible conc of toxic material have been determined by bio-assay using bluegill sunfish as test animals, chemical tests may be used for control. Caution must be used in interpreting bio-assay results because of influence of local conditions on toxicity of specific materials to fish. B. A. F.

392. Sulphur recovery at Grangemouth refinery. Anon. *Petroleum, Lond.*, 1954, **17** (11), 390.—The commissioning of a sulphur production unit has completed Grangemouth's post-war expansion scheme, and the capacity has increased from 360,000 to 2,700,000 tons/year. Other units commissioned include a 60,000 tons/year cat polymerization unit and a Girbitol unit with a capacity of 20 tons of raw sulphur a day. J. B. S.

DISTILLATION

393. Distillation curve correlations. M. van Winkle. *Petrol. Process.*, 1954, **9** (11), 1738–41.—Correlation between ASTM and TBP dist analyses for dist slopes and 50% temp points have been sketchy and prone to error. As now correlation is given based upon extensive dist at atm and sub-atm pressures of several typical crude and dist stocks. The correlations, shown in a series of figures, were developed from the experimental ASTM vacuum dist and the 50 mm TBP dist data. J. H.

394. Azeotropic and extractive distillation. Pt II. G. A. Dummett. *Petroleum, Lond.*, 1954, **17** (11), 388–90.—Details are given of desirable preliminary treatment of the fraction to be dist. Line diagrams of typical extractive and azeotropic plants are given. Selection of the added component is discussed, with particular reference to properties of the solvent, and there is a comparison of the 2 processes. J. B. S.

395. Simplicity, flexibility, economical operation feature Banquette gasoline plant. R. R. Dean. *Oil Gas J.*, 29.11.54, **53** (30), 77.—The natural gasoline plant of the Tennessee Production Co is described. This extracts 70,000 gal/day of products from 100 M.M.c.f. of lean gas. Plant includes a lean-oil dehydration unit using steam for stripping and a demethanizing absorber. Particular attention has been given to instrumentation and to operating flexibility. Gas analysis is given and flow sheet depicted. G. A. C.

ABSORPTION AND ADSORPTION

396. Chemical engineering. IX. Adsorption. D. C. Freshwater. *Inst. Petrol. Rev.*, 1954, **8** (88), 79.—Great use is made in the petroleum industry of the capacity of certain solids to hold on their surfaces large quantities of gases and liq. Different solids so used are selective in effecting this adsorption, and so the process is useful in separating different materials. The process is used typically in the decolorization of high-grade lub oils, removal of gums and potential gum-formers in gasoline, and in catalysis in cracking operations. A theoretical treatise of the process is given, and mention made of the preparation and actual use of adsorbents, with reference to liq and vapour phase refining. This process, which has been developed in the petroleum industry, is now being used to an increasing extent in other industries. R. H.

397. 2-stage saturation of active carbon. A. Ogrodnik. *Nafta (Krakow)*, 1954, **10**, 10–12, 30–2.—Although use of 2 absorption towers would be expected to lead to improvement either by cutting losses of hydrocarbons in exhaust gases or by raising efficiency of absorption, this simple theoretical conclusion is borne out only in the case of one homogeneous vapour. In case of a series of homologues their mutual solubility, displacement, and their relative proportions in the gas confuse the picture. Attempts at improvement of the process failed due to: (1) high velocity of gases which lead to excessive exhaust losses; and (2) the fact that most of the gases entering second absorber were C_5–C_1, *i.e.* difficult to retain. Joining the two absorbers in parallel, low gas velocity is obtained and so efficiency is raised. M. S.

398. Shell expands Ventura gasoline plant. A. L. Johnson. *Oil Gas J.*, 13.11.54, **53** (31), 142.—Capacity of plant is now 333 million cu. ft. gas/day. Increase was obtained without increase in water usage or steam generation. Steam-turbine-driven units take on automatically should power fail. G. A. C.

SOLVENT EXTRACTION AND DEWAXING

399. Chemical engineering. VIII. Solvent extraction. D. C. Freshwater. *Inst. Petrol. Rev.*, 1954, **8** (87), 55.—An operation closely related to those of dist and absorption already described, is that of solvent extraction. This process is widely used in the petroleum industry for the separation of mixtures of liq. It was first developed by Edeleanu for removing aromatic hydrocarbons from kerosine by liq sulphur dioxide. It has since been applied to the refining of lub oils and gasoline. A detailed description of the principles involved in the process is given, and typical examples of its application in practice are indicated. R. H.

400. Liquid–liquid extraction in theory and practice. H. R. C. Pratt. *Industr. Chem. Mfr*, 1954, **30**, 475–82.—Extraction equipment classified into differential-contact types, in which composition of phases changes continuously, and stagewise types, which consist of a number of stages of mixing followed by phase separation. Differential types sub-divided into non-mechanical gravity-separated, or mechanical, with gravity or centrifugal separation. Brief description is given of about 30 different types of equipment under above headings, with illustrations. A. C.

401. Hydrofining improves low-cost-lube quality. W. A. Jones. *Oil Gas J.*, 1.11.54, **53** (26), 81.—Advantages of hydrofining include facts that operation is continuous with relatively simple plant, finished oil yield on feed exceeds 99·5%, no major waste disposal problems, physical properties are improved, and a uniform quality lub oil is produced from varying crude sources. Process was worked out in laboratories of Imperial Oil Co at Sarnia, Ontario. G. A. C.

CRACKING

402. Kinetics of the catalytic cracking of alkylbenzenes. H. F. Rase and R. S. Kirk. *Chem. Engng Progr.*, 1954, **50** (1), 35–44.—Results of cracking 8 mono-alkylbenzenes (ethyl, *n*-propyl, *n*-butyl, *iso*-propyl, *sec*-butyl, *sec*-amyl, *tert*-butyl, and *tert*-amylbenzene) over silica alumina cat are reported with data for conversion *vs* reciprocal space velocity curves obtained at 850°, 950°, and 1050° F. Enthalpy of activation for these compounds was found to be constant and the alkylbenzene absorption constant K_a at 950° F correlated with the strength of the bond joining the alkyl group to the benzene nucleus, also the benzene absorption constant K_r was found to be constant for all compounds investigated. Data are also presented for carbon formation in the cat. J. G. H.

403. Association News—Conference on thermal cracking. Anon. *Nafta (Krakow)*, 1954, **10**, 21.—Conference took place on 2.12.53 in Krakow and decided that since brown coal may have to be used as a source of liq fuels a pilot plant must be brought into operation and technical staff trained. M. S.

404. Pure Oil operates model-B Orthoflow cat unit. G. Weber. *Oil Gas J.*, 18.10.54, **53** (24), 99.—The first commercial unit has been in operation for 9 months at Pure Oil Co's Toledo refinery. In the Model-B arrangement the regeneration is positional directly over the reactor, with the result that there is a marked reduction of operating costs. G. A. C.

405. Close intregation, central control, and new ideas in cat cracker instrumentation. L. G. Alexander, J. T. Zeien, and H. Hawkins. *Oil Gas J.*, 1.11.54, **53** (26), 78.—The International Refineries Inc, Wrenshall, Minn., plant includes atmospheric crude dist unit, F.C.C. unit, light ends and gas recovery, solid-bed phosphoric acid polymerization unit, and product treating. Crude oil enters plant and finished products are sent to storage, with elimination of usual intermediate storage; all processing units are controlled from a single graphic panel board. The F.C.C. unit instrumentation uses 2 unusual cascade systems for temp and pressure control. G. A. C.

406. Fluid coking yields. F. B. Johnson and R. G. Wood. *Oil Gas J.*, 29.11.54, **53** (30), 60.—Data are presented on fluid-coking of 10 residuum stocks of wide range of quality, which shows that the fluid-coking process is easily adapted to operation on any residuum stock. Coke production varied according to the Conradson carbon of the feed-stock, and was much less than that obtained by delayed coking. More gas oil, less naphtha, and somewhat less gas were produced than by the delayed coking process, and the gasoline from fluid coking has an appreciably higher O.N. G. A. C.

407. New catalyst recovery device. W. E. Askey, S. W. Dedman, and J. W. Smalling. *Petrol. Refin.*, 1954, **33** (10), 137–40.—It has been found that decrease in the activity of hydroforming cat (molybdena on an alumina base) is accompanied by a decrease in bulk density. This density difference, combined with a size separation system, is used to separate active cat from foreign bodies, dust, and spent cat, permitting the fullest use of all cat before it is discarded. A batch of cat which previously would have been discarded as spent was processed in this way and 75% recovered as fit for further use. D. D. S.

408. Advantages of the pebble heater. M. O. Kilpatrick, L. E. Dean, D. S. Hall, and K. W. Speed. *Riv. Combust.*, 1954, **8** (7–8), 513–25.—In the field of light hydrocarbon cracking, the pebble heater developed by the Phillips Petroleum Co has considerable process advantage in higher yields and higher conversions. Investment for a pebble heater will be slightly more than for a tube furnace for hydrocarbon cracking. However, economic evaluation of the cracking and recovery steps as a whole should show considerable advantage for the pebble heater. The pebble heater has uses other than hydrocarbon cracking with which the tube furnace cannot compete. These uses include the heating of corrosive materials as well as the superheating of steam, air, or inert gases to very high temp. In these fields of operation, the investment costs for a pebble heater would be less than for hydrocarbon service. The pebble heater is a valuable contribution to the ever-widening field of high processing equipment. (Authors' abstract.)

409. Gasoline refining in vapour phase. S. Gibinski. *Bull. Polish Inst. Petrol.*, 1954, **4**, 2 (*Supp. to Nafta (Krakow)*, 1954, **10**).—Early experiments with Gray's method of vapour phase, activated earth refining show that this method suits well the kind of gasolines obtained by cracking of suitable fractions from Polish crudes. M. S.

410. The design of hyperforming units. C. Berg. *Petrol. Refin.*, 1954, **33** (10), 153–7.—The hyperforming process is a general purpose reforming and stock upgrading operation. Cat moves down the reactor under gravity flow, and is returned to the top by the Hyperflow system as a compact, unfluidized mass, being regenerated on the way. Some components are described here, and some operating, yield, and cost data are given. R. D. S.

411. Chemistry and technology of Houdriforming. J. C. Bart, A. G. Oblad, and H. Heinemann. *Bull. Ass. franç. Tech. Pétrole*, 1954, 449–70.—Process can be operated either for production of aromatics (BTX) or high O.N. gasoline, in either case H_2 is by-product. Pt-containing cat is dual function, causing basic reactions of isomerization and dehydrogenation to occur together. Results of lab tests (aromatization of naphthenes, isomerization of paraffins) on pure compounds are given. S removal is 94 + % effective. Effect of process variables on reaction trends is described. Cat is resistant (6 tons or more throughput per kg before regeneration) provided feed preparation is adequate. Preferred feed for gasoline production is 85°–185° C naphtha. O.N. *vs* yield curves for various feeds are given. 10 existent or planned Houdriforming units (45–860 × 10^3 tons/year) have total capacity 3·5 m tons/year. V. B.

412. The Platforming process. G. Egloff. *Fluid Handl.*, 1954, **58**, 297.—The Platforming process is satisfying the demand for higher octane requirements in gasolines, for aromatic hydrocarbons, for chemical manufacture, and for hydrogen for upgrading charging stocks. The charge is heated and passed with recycle hydrogen through a series of reactors containing Platforming cat. The products are cooled and separated into liq and gas, and the liq products are stabilized. Operating conditions depend on the product required. Octane numbers increase with temp rise, and aromatic and hydrogen yields increase with temp rise or pressure reduction. At least 6 simultaneous reactions occur, involving isomerization, dehydrogenation, and desulphurization. The versatility of the process can be used as a buffer for changing economic conditions. D. J. S.

413. Aromatics manufacture over Platforming catalyst. W. K. Meerbott *et al.* *Industr. Engng Chem.*, 1954, **46** (10), 2026–32.—Data obtained from a pilot-scale, non-regenerative process indicate that a minimum partial pressure of hydrogen greater than thermodynamically desirable is necessary to prevent deactivation of cat by coke formation. Deactivation by sulphur compounds was rapid with sulphur concn above a threshold range, the range being a function of hydrogen partial pressure. Experimental work on the effects of short and continued exposure to high sulphur concn led to a tentative explanation of sulphur poisoning. B. A. F.

414. Efficiency of various alkali metals in the *iso*butylol contact. F. Runge and K. Zepf. *BrennstChemie*, 1954, **35** (19–20), 307.—Errors in the article under the above title in (11–12), 168 and 169 are corrected. R. T.

HYDROGENATION

415. Manufacture of transformer oils by hydrogenation of shale oils. B. Braae. *IngenVetensk Akad. Handl.*, 1954, (211), 1–70; *Chim. et Industr.*, 1954, **72**, 687.—Cat hydrogenation; suitable cat are discussed, 3 main types, iron sulphide, and Mo and W, either alone or on carriers. Yield is improved by cat activators, *e.g.* complex molybdates. Ljungström shale oil has given satisfactory results, 400° C, 24 hr. V. B.

416. Hydrofining's use in product improvement. A. C. Patterson and M. C. K. Jones. *Oil Gas J.*, 18.10.54, **53** (24), 92.—This is the first of a series of 5 articles on hydrofining. The process is one of several hydrogenation types which utilize by-product hydrogen from cat reforming to upgrade a wide variety of petroleum products and intermediate processing streams. The process is licensed by the Standard Oil Co. (N.J.). This article gives 13 tables dealing with hydrofining of naphtha, cracked naphtha, kerosine, diesel fuel, and lub oil. G. A. C.

ALKYLATION

417. Three unusual features in new HF alkylation unit. D. P. Thornton. *Petrol. Process.*, 1954, **9** (10), 1570–3.—The new 1800-b.d. HF alkylation unit on stream at Cosden Petrol Corpn, Texas, embodies unusual features, the use of a mixture of olefins as feed in a horizontal contactor with defluorination of the product propane, *n*-butane, and alkylate streams. Details of the contactor are given, together with a process flow diagram. J. H.

CHEMICAL AND PHYSICAL REFINING

418. Two ways to reduce stream pollution. O. J. Zandona and C. W. Rippie. *Oil Gas J.*, 22.11.54, **53** (29), 89.—Simple and economic solutions to the chemical treating problem are given. Regeneration of spent caustics can be achieved by external atomic-oxygen oxidn using the Rippie electric process, and the amine salt–H_2S process can be used to extract hydrogen sulphide from hydrocarbon streams. Schematic flow sheets of mercaptan extraction and caustic soda regeneration and for H_2S extraction units are given. G. A. C.

SPECIAL PROCESSES

419. Chemical engineering. X. Filtration. D. C. Freshwater. *Inst. Petrol. Rev.*, 1954, **8** (89), 95.—Filtration is a common enough lab process which is used extensively in the petroleum industry for the separation of solid and liq (or gaseous) phases. An example is the separation of crystallized wax from lub oils. The theory of filtration is treated mathematically, and it is pointed out that this process, like many others, may be batchwise or continuous. Typical examples of each are given, and certain kinds of filter are described in detail. R. H.

420. Ammonia manufacture—1954 version. F. L. Resen. *Oil Gas J.*, 13.12.54, **53** (32), 120.—The Lion Oil Co's Barton ammonia plant is described. Features are improved lub oil recovery facilities, substitution of aqua-ammonia for caustic wash in the purification section, an improved recompression system used in storage of ammonia, and compact, out-of-doors plant. Flow diagrams are provided. G. A. C.

METERING AND CONTROL

421. Chemical engineering. XI. Instrumentation. D. C. Freshwater. *Inst. Petrol. Rev.*, 1954, **8** (90), 113.—Now that batchwise operation in the petroleum industry has been replaced by continuous processes, with the advantages of products of constant quality at lower cost, the importance of instrumentation has increased tremendously. Instrumentation involves the control and recording of process variables, the more common of which are pressure, temp, and flow, although liq level, pH, density, and other physico-chemical properties are sometimes involved. Details of instrumentation for pressure, temp, and flow are given, and other types are also described. R. H.

422. Instrumentation for continuous analysis. Anon. *Petrol. Times*, 12.11.54, **58** (1444), 1165.—General problems in sampling, filtering, and removal of droplets from gas samples,

control of sample temp, control of flow and pressure, and experience with sampling systems are among points considered in this article. G. A. C.

423. The elements of some quality control instruments. Anon. *Inst. Petrol. Rev.*, 1954, **8** (93), 173.—The subject of instrumentation has not yet been covered in a text-book despite its tremendous importance in current refinery technique. This article describes the principles behind the automatic execution of a number of routine refinery control techniques in use today. They include: (1) Engler visc; (2) recording viscometer (of which there are many types); (3) colorimeter (measurement of a property often associated with qualities such as oxidn stability); (4) refractometry; (5) dielectric properties (*e.g.* of insulating oils); (6) carbon–hydrogen ratios (involving the use of radio-active rays); (7) sulphur and lead analyses (involving X-ray absorption); (8) mercaptan measurement (the control of these evil-smelling compounds is important); (9) oxygen analysis; (10) infra-red gas analyses. The use of such techniques involves an increased saving of time and money. R. H.

424. Where we stand on bulk-oil measurement. Anon. *Oil Gas J.*, 15.11.54, **53** (28), 193.—Importance of measurement, fundamental definitions, improved methods of measurement, and, in equipment, gauging, measurement of temp, and of quality and quantity are subjects dealt with in this article. G. A. C.

425. What's the score on electronic process control? D. M. Boyd and R. Gilliland. *Oil Gas J.*, 8.11.54, **53** (27), 136.—Rock Island Refining Corpn has recently put on stream at Indianapolis the first refinery unit in the U.S.A. to be completely instrumented and controlled by electronic means. The plant concerned is a new 2400 brl/stream day UOP Platforming Unit. Several advantages are claimed for electronic controllers, including greater reliability in cold climate, better control, and increased flexibility. Operating results so far seem to indicate that for some installations electronic instrumentation will give superior control results, and at a cost less than for a pneumatic installation. An explanation is given of how the electronic process operates. G. A. C.

426. How Magnolia meters a 20-inch crude stream. J. J. Harris. *Oil Gas J.*, 6.12.54, **53** (31), 54.—Metering operations at Beaumont, Tennessee, involve use of orifice type, area type, and positive displacement type meters. The orifice type is used to measure and record instantaneous main-line rates of flow, the area type (rotameters) are used in conjunction with flow controllers to blend crude oils, whilst positive displacement type meters are used to meter all types of crude to the refinery, and that gathered at the terminal and pump station, as well as strapping large-dia floating-roof tanks. The experience has proved the accuracy and reliability of positive type displacement meters, and gravimetric type proving equipment has also proved successful. G. A. C.

PRODUCTS

CHEMISTRY AND PHYSICS

427. Chemical engineering fundamentals: catalysis and adsorption. I. T. E. Corrigan. *Chem. Engng*, 1954, **61**, 236.—In the first of a series of 9 articles on the kinetics of heterogeneous reactions, the functions of cat are discussed. The rate-equilibrium balance, pseudo-equilibrium, and selectivity of cat are described. The physical and chemical steps in a cat reaction are analysed. The chemical steps include chemisorption, which is discussed. For the process of chemisorption the Freundlich and Langmuir equations are derived. D. J. S.

428. The importance of chemical engineering studies in relation to process development. H. Hoog. *Trans. Inst. Chem. Engrs*, 1954, **32** (1), 61.—The importance attached to chemical engineering unit operations as an integral part in the development of new projects and modification of existing processes commercially is discussed in this paper. Reference is made to 3 distinct examples, *i.e.* (1) sulphation of olefins in cracked dist to produce synthetic detergents; (2) cat cracking of heavy hydrocarbons in manufacturing anti-knock fuels; and (3) cat desulphurization of oil dist. In these particular cases the fundamentality of heat and mass transfer in reactor design is significant. The organization and some published research work of the Royal Dutch/Shell Company in Amsterdam are also included in this analysis. E. A. G. H.

429. A correct arrangement of hydrocarbons as a basis of a systematic plan for organic compounds. J. Jurkiewicz. *Nafta (Krakow)*, 1954, **10**, 12–16, 32 (Pol).—Author finds the present homologous series inadequate for the description of condensed systems and proposes to assign each hydrocarbon a point in a system of rectangular co-ordinates. His ordinate and abscissa are N and n, being respectively $4\frac{n}{m}$ and n of the familiar C_nH_m. This reduces to C_nH_4 and m determines the slope of a line connecting all first, all second, etc., members of all homologous series.

Where such series is made up by addition of ·CH_2· (paraffins, diolefins, and $C_6H_5(CH_2)_xH$) is tends asymptotically to the value $N = 2$. The line $N = 2$ is occupied by olefins. Where such a series is made up by an addition of an extra condensed benzene ring, as in progress from benzene to naphthalene or from indene to fluorene, the value of N approaches 8. N at infinity is called $\dot{N}$ or "group" N. Each homologous series begins above or below the asymptotic line up or down by the number of places by which value of $\frac{n}{m}$ in its original radical falls short of or exceeds its homologous increment. This value is denoted by β, and it enters into the formula $m = \frac{4(n \pm \beta)}{\dot{N}}$.

According to the kind of the group added, the same compounds can be at the head of several homologous series, *e.g.* C_6H_6 heads $C_6H_5{\cdot}CH_2$, etc., $C_{10}H_8$, etc, or $C_{13}H_{10}$ (adding ·C_6H_4·), etc., and C_2H_4 heads the series C_6H_{12}, $C_{10}H_{16}$, etc. Here $\dot{N}$ is fractional and since $\delta n = 4$ and $\delta m = 6, \dot{N} = 4\frac{\delta n}{\delta m} = \frac{8}{3}$.

It is, however, of great importance when condensed rings series are concerned to be able to determine all members of such a series and to consider their physical properties. Here the graphical method is necessary. Once the compound is placed, the C–H ratio is determined, and it can be projected on the hypotenuse of triangular co-ordinates system with other elements at the right angle. A series of homologues will retain its appearance when projected from one graph to another. M. S.

430. Fuel research—1953. Anon. *Petroleum, Lond.*, 1954, **17** (11), 401–6.—Work has been continued on the synthesis of oils and the effect of H_2 : CO ratio and state of the cat in the Fischer–Tropsch process. The reaction method has been investigated by studying the composition of the products and by using radio-active tracers. The structure of fuel oils has been examined and work on the separation of residual oils into components carried out, particular attention being paid to resins and asphaltenes. Visc of oils have been measured using a new coni-cylindrical recording viscometer with electromagnetic torquemeter. Separation of emulsions of fuel oils and sea water by means of an electric field has also been investigated. J. B. S.

431. The vapour phase partial oxidation of *n*-butane—effect of pressure, reaction time, and inlet gas composition. D. Quon, I. Dalla Lana, and G. W. Govier. *Canad. J. Chem.*, 1954, **32**, 880–95.—Data are presented on the product yields and the

general course of the partial oxidn of *n*-butane at an ambient temp of 725° F, at pressures varying from 50 to 175 p.s.i.a., reaction times of 1·0–4·5 sec, and inlet reactant compositions of 1·5–6·0 mol % *n*-butane and 1·5–6·0 mol % oxygen (the remainder being diluent nitrogen). Conditions were neither isothermal nor adiabatic, and peak temp as much as 70° F higher than the inlet temp were encountered. The reactor consisted of a 24-ft length of ½-inch stainless steel pipe, immersed in a bath of boiling Aroclor 1254. Under optimum conditions, a 20% conversion of the butane to methanol, ethanol, acetaldehyde, acetone, and formaldehyde was obtained. In all the tests an induction period of approx 0·75 sec was observed. J. G

432. Establishing a foam point above the fixed point of paraffins. E. Terres *et al. BrennstChemie*, 1954, **35** (17–18), 263–9.—3 surface phenomena arise in the unexplained foam formation with paraffins: occurrence of dense foam, particle migration on the crystallizing surface, and a kink in the γ–t curve. Other properties connected with int particle arrangement are regular. Thus, the basis of the foam point is superficial, its position and absence of undercooling characterize a crystallization precondition. These conditions imply that, before the set. pt., the surface mol layer with paraffins of determined chain-lengths can assume a degree of order corresponding to the cryst state, *i.e.* pass from close order of liq to 2-dimensional remote surface order. Dense foam below the foam point indicates stiffening or reconstruction of the bubble interfaces, produced by shaking. The special orientation just with chain compounds is explained by the difference with the spherical surface mol which are exposed to the dynamic effects expressed as γ, whereas in chain mol the force of a definite spatial order is added, provided that foam-preventing coiling does not occur. The time factor is involved in the peculiar behaviour in measurement of γ-val in the foam region. No surface equilibrium occurs with rapid bubble formation, with slow formation true dynamic γ-equilibrium is reached and crystallization occurs. Sinking of γ-val by 2–3 dyn/cm, which occurs normally at the set. pt. in foam-forming substances (3-methyleneicosane), is spread over the whole foam region, resulting from incipient crystallization; the measured val belong to true equilibrium γ. The possibility of paraffin crystallization in different forms is discussed. 17 literature refs. R. T.

433. Oxidation of mineral oils. I. Ageing properties of non-inhibited transformer oils. H. Pöll, F. Pass, and A. Schram. *Erdöl u. Kohle*, 1954, **7**, 717–20.—4 oils (3 Austrian, 1 U.S.) were subjected to varying furfural and H_2SO_4 refining and tested for oxidn resistance (Kissling Tar No). Results indicate that over-extraction can worsen stability, as can over-refining with acid; worsening is especially marked on acid treatment of raffinates. There is no relation between oxidn resistance and structure as given by *n–d–M* analysis. Acid wash stage after solvent is recommended, but should be very slight, *e.g.* dilute acid. Narrowing of cut is of no advantage, and may lead to earlier sludge precipitation, owing to absence of high mol. wt. sludge-solvent components. V. B.

434. Use of the tube method for determination of combustion velocities. H. Guénoche and M. Jouy. *Rev. Inst. franç. Pétrole*, 1954, **9**, 562–72.—Calculation of cross-sectional area of tube, rate of flame propagation, and cross-sectional area of combustion front, and errors involved, are considered. For first factor probable accuracy is *ca* 1%, for second, using Mallard–Le Chatelier procedure for determining time taken for flame to travel known path, it is >1%. Main part of paper deals with discussion of methods used by various workers for calculating cross-sectional area of combustion front. It is concluded that this factor is biggest source of error, and that hence attempted explanation of differences in results between tube and burner methods is not warranted. V. B.

435. International flame radiation research committee; its organization and work. M. Michaud and G. Monnot. *Rev. Inst. franç. Pétrole*, 1954, **9**, 509–27.—Description of experimental plant available to committee and summary of results obtained in first 6 series of tests (1949–53) carried out at Ijmuiden and of 3 series (1952–3) with the Stockholm oven. Scope of future work is outlined. 23 diagrams, showing results and depicting burner types. (*Cf.* Abs. **1799**, 1954.) V. B.

436. Reducing carcinogenicity of high-boiling petroleum products. L. T. Eby *et al. Industr. Engng Chem.*, 1954, **46** (10), 2209–13.—Results of preliminary examination of 5 methods of reducing carcinogenicity—air oxidn, ozonization, hydrogenation, alkylation, and selective adsorption—are given. The possibility of the inhibition of carcinogenic activity by use of suitable additives is suggested. B. A. F.

437. The surface and interfacial viscosity of adsorbed films of asphalt. B. C. Blakey and A. S. C. Lawrence. *J. Inst. Petrol.*, 1954, **40**, 203–5.—The stability of water in fuel oil emulsions is due to the asphalt present, which has been shown to form a film of extremely large non-Newtonian visc at the hydrocarbon–water interface. A. R. W. B.

438. Variables affecting activity of molybdena–alumina hydroforming catalyst in aromatization of *cyclo*hexane. C. G. Rudershausen and C. C. Watson. *Chem. Engng Sci.*, 1954, **3** (3), 110–21.—A study is described to determine the nature and magnitude of the more obvious variations in the activity of a single batch of co-precipitated molybdena–alumina gel-type hydroforming cat. The cat, similar to those used in the petroleum industry, was utilized in a differential reactor to aromatize *cyclo*hexane. Graphs included show the variation of activity with the amount of reduced promoter (MoO_3) and the effect of hydrogen flow rate on carbon deposition. Cat regeneration rate appears to be initially a function of the coke concn, whilst in the second stage, when no improvement in activity is reported, mass transfer is the controlling mechanism. E. A. G. H.

439. Prediction of ASTM end points of blended light petroleum products. M. E. Stanley and G. D. Pingrey. *Industr. Engng Chem.*, 1954, **46** (10), 2182–5.—Correlation is by means of the end point minus the 90% point temp of the high end point stock in the blend. Tables are given from which the ASTM blend end point may be predicted. B. A. F.

440. The Melchett Lecture for 1952. "Highways and by-ways in combustion." D. T. A. Townend. *J. Inst. Fuel*, Nov. 1954, **27** (166), 534.—3 aspects are discussed, being: (1) gaseous explosions at high pressures; (2) the spontaneous ignition of higher hydrocarbons in relation to engine knock; and (3) burner stability. 37 literature refs. D. K.

ANALYSIS AND TESTING

441. Determination of the ageing tendency of oils. O. Widmaier. *Erdöl u. Kohle*, 1954, **7**, 569–72.—Glass apparatus (illustr), 50 ml oil, 190° C (can rise to 210° C if reaction is strongly exothermic), 5 ml/sec O_2, 3 hr, volatile oxidn products collected in dist H_2O and tested hourly for acids and for aldehydes + ketones. Detailed results are given on 4 oils (d_{15} 0·888–0·903, 1·67°–1·78° E/100° C); tests are also made on oils containing oxidn inhibitors (unspecified), and on petroleum ether insol portion of oxidized oil. It is considered that determination of volatile oxidn products gives valuable guide to oxidn resistance of oil; preliminary indications are that for satisfactory behaviour in I.C. engine, oil should give high aldehyde + ketone value, but be low in volatile acids. V. B.

442. German (draft) standard. Determination of ionizable chlorine. Anon. *Erdöl u. Kohle*, 1954, **7**, 660.—DIN 51800. Grease is extracted with hot dil HNO_3, extract reacted with $AgNO_3$ and titrated with NH_4CNS, using ferrous ammonium

sulphate indicator. Reproducibility and repeatability ±0·002% Cl. V. B.

443. German (draft) standard. Determination of flow point and drop point. Anon. *Erdöl u. Kohle*, 1954, **7**, 659–60.—DIN 51801. Ubbelohde apparatus, material (grease or petroleum jelly) is heated in a metal nipple till it begins to flow or drops therefrom; reproducibility ±2° C, repeatability ±4° C. V. B.

444. Quantitative determination of halogens in ethyl gasolines. M Randi. *Riv. Combust.*, 1954, **8** (3), 175–83.—The author describes 2 analytical procedures for the quant determination of halogens in ethyl gasolines. The procedure does not require special apparatus, and can be easily carried out with conventional lab equipment. The former, based on the decomposition of halogenated compounds by magnesium methylate determines the bromides directly and selectively; the latter, based on the use of sodium methylate, determines halogens together. Chlorides are calculated by difference. (Author's abstract.)

445. How 10W-30 motor oil performs. R. L. Overcash, W. Hart, and D. J. McClure. *Petrol. Refin.*, 1954, **33** (10), 99–103.—Summarizes the results of lab and road tests for the comparison of conventional crankcase lubricants with multi-graded oils. A SAE 10W-30 oil blended from carefully selected components is claimed to have superior combustion chamber deposit properties, satisfactory oil consumption characteristics, and to maintain its visc and high V.I. for normal periods of use. R. D. S.

446. Completely automatic softening point apparatus. L. Deile. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (8), 254.—The instrument described and illustrated is fully automatic, with accurately controlled elec heating and insulated R. & B. apparatus. R. T.

447. Fluorescence in oils. A. E. Williams. *Sci. Lubric.*, 1954, **6** (10), 24–5.—Basic principles of fluorescence analysis are outlined, and its applications to the grading of oil fractions, the analysis of lub oils, identification of additives, and checking for contamination are briefly indicated. J. G. H.

448. Contributions to the study of lubricating oils through the Precision Shell Four-Ball Testing Machine. Pt II. Report and interpretation of results. A. Girelli, C. Palcari, and C. Siniramed. *Riv. Combust.*, 1954, **8** (5), 339–54.—Results of different tests carried out in the Precision Shell Four-Ball Testing Machine on 8 commercial oils are reported. An accelerated method is proposed for the determination of Mean Hertz Load of E.P. lubricants by which a substantial saving of time and material can be obtained. The proposed method is based on the drawing of a "compensation line" which allows the elimination of runs to be carried out under applied loads lower than the seizure initial load. (Authors' abstract.)

449. Catalyst testing procedure. Anon. *Petrol. Times*, 26.11.54, **58** (1495), 1219.—Cat are checked for quality in accordance with a number of simple tests, such as for activity, carbon formation, contaminant level, particle size, surface area, pore vol, and pore dia. The data obtained on used cat are used to determine whether any trends are apparent, and fresh addition rates are adjusted to counter these. The methods described were developed at the Abingdon laboratories of the Esso Development Co. G. A. C.

450. Progress reports on API Research Projects. Anon. *Oil Gas J.*, 15.11.54, **53** (28), 324.—Reports on 7 Research Projects are given; these include Analysis, Purification, and Properties of Hydrocarbons (6); High-Molecular Weight Hydrocarbons in Petroleum (42); Data on Hydrocarbons and Related Compounds (44); Low-Molecular Weight Hydrocarbons in Petroleum (45); Sulphur Compounds in Petroleum (48); Thermodynamic Properties or Hydrocarbons (50); and Nitrogen Compounds in Petroleum (52). Parts and patterns of future work are outlined. G. A. C.

451. Radioactive isotopes for measuring piston ring wear. J. H. Deterding and A. Dyson. *Engineer, Lond.*, 1954, **198**, 442–5.—Piston rings of normal composition (*i.e.* cast iron containing Si, Mn, P, Cr, Co) were irradiated in the Harwell pile to prpduce a number of radio-isotopes. After allowing ring activity to decay for about 4 weeks, main sources of γ-radiation were Fe^{59} and Co^{60} isotopes. By circulating crankcase lub oil from test engine continuously through counting cell of a scintillation counter, actual piston ring wt losses into lub oil could be calibrated against counting rate within ±7½%. Automatically recorded traces of ring wear against time are given under different engine operating conditions. It is concluded that this method is particularly suitable for following wear in detail over short intervals of time (a few hours), but conventional methods are better for long term work. Safety precautions in handling radio-active rings are given. A. C.

452. The oxidation, decomposition, ignition, and detonation of fuel vapours and gases. XXIII. The effect of flow configuration: *n*-pentane and acetaldehyde in combustion tubes of various materials. R. O. King, S. Sandler, and R. Strom. *Canad. J. Tech.*, 1954, **32**, 102–26.—The flow, combustion, and explosive ignition of mixtures of *n*-pentane or acetaldehyde with air was studied in various tubes with a steep temp gradient. The tubes used were made of steel, silica, glass, aluminium, magnesium, graphite, and carbon. In many cases ignition occurred at a low and again at a high temp. It was concluded that ignition in the high temp range is an effect which depends on the inflammability of the boundary layer and the temp of the surface over which it is passing. A hypothesis, based on peroxide formation, is advanced for the ignition in the low temp range. J. G.

453. Paper chromatography in the chemistry of coal oxidation products. K-G. Beck. *BrennstChemie*, 1954, **35** (17–18), 275–9.—A paper chromatographic method is described for the detection of carboxylic acids occurring in HNO_3-oxidn products of coals. The determination is carried out on the ammonium salts in an ascending chromatogram. It is more rapid and cheaper than the conventional dist and crystallization of the methyl ester, in which diazomethane is necessary for complete esterification; it is applicable for routine analysis. Improvement in the differences in Rf val (quotient of migration of substance and of solvent) for the isomeric phthalic acids—difficult to separate—is obtained by double chromatography as described. 10 literature refs. R. T.

454. Application of chromatography to investigations of crudes. A. Kwaciszewska. *Bull. Polish Inst. Petrol.*, 1954, **4**, 1–2 (Suppl. to *Nafta* (*Krakow*), 1954, **10**). Unsuccessful attempts are described, but better methods will bring better results. M. S.

455. Photography in oil research. Pt I. A. J. Insall and J. W. Drinkwater. *Petroleum, Lond.*, 1954, **17** (10), 350–4.—Photography is used either as a recorder of research results or as the research tool, *e.g.* X-ray diffraction. Examples of the former are: measurement of interfacial tension, airflow in gas turbine combustion chambers, and atomization of liq fuels.

Erosion of refractory linings of process plant has been examined by infra-red photography, and metals in lub oils have been detected by spectrographic means. J. B. S.

456. New viscometer solves old problems. J. J. Watt and C. E. Headington. *Petrol. Refin.*, 1954, **33** (10), 121–5.—A description of a durable routine capillary type viscometer giving values in fundamental units. It has been in constant service for 15 years during development, and has been accepted by the ASTM. Once the viscometer has been sealed into the temp bath and connected to the vacuum manifold (used for filling and cleaning), it does not have to be handled for months. R. D. S.

457. A thixoviscometer for production control. C. B. W. Richardson. *Paint Tech.*, Oct. 1954, **18** (205), 47.—The construction and calibration of the instrument are described, also its mode of operation and methods of cleaning the apparatus. Some results obtained using the viscometer are included. D. K.

GAS

458. Towns gas production from water gas, natural gas, and liquefied gases, and observation of the changes in the C–H–O-triangle. F. Schuster. *BrennstChemie*, 1954, **35** (19-20), 304–7.—Gases with the combustion properties of towns gas can be obtained by physical and chem methods from water gas and rich gas. The water gas must be carburetted and the rich gas lowered in cal. val. Criteria for combustion quality are cal. val., density, and H_2 cont; this as a measure of ignition rate. The C–H–O-triangular diagram presented records fuel gas composition in the N_2-rich region, chem changes and their results, also elementary composition and sp property val. R. T.

459. Methods of gas dehydration for 1954. J. M. Campbell. *Petrol. Engr*, 1954, **26** (10), C11–14.—Hydrate prevention is advisable when gas pressure exceeds 200 p.s.i.g. This is accomplished by: (1) gas heaters; (2) injection of hydrate inhibitors, *e.g.* methanol or glycol; (3) well head dehydration in which glycol dehydrators, operating above 300 p.s.i.g., are used. Dry desiccant dehydration, although expensive, is used, tendency being for desiccants with higher sorptive capacities and continuous systems using fluidized particles. J. B. S.

ENGINE FUELS

460. Purification of crude and heavy oils for diesel engines by means of self-cleansing separators. W. Opdenberg and H. Hemfort. *Erdöl u. Kohle*, 1954, **7**, 724–8.—Description (illustrated) of "Westfalia" separators. Preferred layout is 2 machines in series, of which the first has self-cleansing drum and the second normal drum; trend is to sealed separators operating at higher temp (120°–150° C). V. B.

461. Deposit formation in spark-ignition engines. F. Kneule. *Erdöl u. Kohle*, 1954, **7**, 720–4.—Review of recent U.S. work, including effect of additives and of lub oil. V. B.

GAS OIL AND FUEL OIL

462. The distribution and uses of fuel oil in the U.K. T. D. Ambrose. *Inst. Petrol. Rev.*, 1954, **8** (88), 68.—In 1951, out of a total of nearly 17 million tons of petroleum products used in the U.K., just over 6 million tons were fuel oil. This is a measure of the attempts being made to change from coal to oil fuel whenever practicable, as a result of the shortage of coal at the present time. The history of the distribution of oil products in the U.K. is traced from 1914, when kerosine was the main product, to the present day, when bulk distribution plays so large a part. The main industrial uses of fuel oil are described, and include: (1) boilers (steam raising for process work and central heating); (2) steel manufacture (chiefly furnace heating); (3) metal protection (enamelling and galvanizing); (4) glass manufacture (furnace heating); (5) ceramics; (6) non-ferrous metal industries; (7) baking; (8) agriculture. Mention is also made of diesel rail traction, an outlet which is being developed. It is anticipated that production of fuel oil will increase in the years to come, and steps are being taken to meet this expected demand. R. H.

463. Special study of sulphur removals and recovery from fuels. Summary of proceedings of the London Conference. *J. Inst. Fuel*, Nov. 1954, **25** (166), 530.—A summary of the main conclusions as given by the official rapporteur, Dr J. G. King. Aspects discussed included: social and industrial consequences of sulphur in fuels, deleterious effect of fuel sulphur in metallurgy, sulphur supplies and requirements in the U.K., the occurrence and removal of sulphur in coal and oil, and removal of sulphur from fuel gases. D. K.

464. The effect of auxiliary fuel firing on the SO_3 content of flue gases from a coal-fired boiler. K. Barker and P. F. Corbett. *J. Inst. Fuel*, Oct. 1954, **27** (165), 495.—A series of trials carried out in a coal-fired power-station boiler is described. They were made with a view to reducing SO_3 content of flue gases. Experiments involved burning: (1) pulverized pitch in aux pulverized fuel burners; (2) a moderately high-volatile coal in these burners, using partly inert gases as a carrier; (3) aux fuel oil at the back of the combustion chamber, with and without the use of aux pulverized coal; and (4) aux creosote pitch at the back of the combustion chamber, with and without the use of aux pulverized coal, additional to the coal normally fired on the chain-grate stokers. From readings obtained from the rate of build-up of acid on the dew-point meter it is shown that all these methods of fuel burning produce some reduction in SO_3 content of the flue gases, but creosote pitch as aux fuel is most efficient. 12 literature refs. D. K.

465. An air-blast atomizer for use with viscous fuels. H. Clare and A. Radcliffe. *J. Inst. Fuel*, Oct. 1954, **27** (165), 510.—This atomizer was developed by the National Gas Turbine Establishment. An essential feature of the atomizer is that the fuel is introduced radially inwards into a swirling air stream just before this debouches from the atomizer into the combustion chamber. The performance is discussed. Measurements were made on 2 atomizers with mixing sections such that one was of twice the linear dimensions of the other. D. K.

LUBRICANTS

466. Boundary friction of very well lubricated surfaces. E. Rabinowicz. *Lubric. Engng*, July–Aug. 1954, **10** (4), 205–8, 230.—Details are presented of an investigation into the frictional forces under boundary lubrication, using a hemispherically ended rider held stationary with respect to a horizontal flat specimen mounted on a rotating steel disk. The apparatus is described and illustrated, and its use in sliding tests is explained. Results obtained indicate that in some cases the major contribution to frictional forces may arise from shearing forces within the lubricant film; also, in the absence of ploughing, good lubricants can reduce the contribution of metallic contacts to a minor part of the overall friction. It also appeared that when the softer member of a rubbing pair of members is held fixed, the friction is independent of the choice of the harder metal. J. G. H.

467. Tentative glossary of lubrication terms. Anon. *Lubric. Engng*, July–Aug. 1954, **10** (4), 199–204.—Tentative publication for comment and discussion of a glossary of lubrication terms completed by the ASLE Educational Committee for the purpose of establishing standard definitions for Educational Committee publications. J. G. H.

468. Performance and testing of lubricating grease under wet operating conditions. H. L. Hendricks and J. D. Smith. *Inst. Spokesm. nat. Lubric. Gr. Inst.*, July 1954, **XVIII** (4), 12–20.—The importance of grease behaviour under wet operating conditions is stressed, and characteristics of conventional greases under such conditions are indicated, together with the tests called for in this respect in U.S. Military Specifications. Essential qualities to ensure satisfactory performance under the postulated conditions are enumerated, and test results using glass jar corrosion and wet oscillating friction machine tests are tabulated. These indicated the value of metallo-

organic and straight polar additives as a means of combating water contamination. J. G. H.

469. Oxidized petroleum wax as a grease base. J. C. Kirk and E. W. Nelson. *Inst. Spokesm. nat. Lubric. Gr. Inst.*, June 1954, **XVIII** (3), 8–16.—The necessity of there being available for the production of soap-thickened greases a saponifiable base of uniform composition and subject to minimum price fluctuations is remarked, and details are presented of an investigation into the potentialities of oxidized paraffin wax for this purpose. The method and equipment used for oxidn, employing a mixture of manganese dioxide and zinc stearate as cat, is described and illustrated, and cat composition and the mechanism of the reaction are considered in some detail, with data on the role of the cat. Sodium, mixed base sodium–calcium, and lithium base greases were successfully prepared using oxidized wax; aluminium and calcium base greases were less satisfactory, and barium was tried without success. The properties of the greases so prepared are briefly discussed. J. G. H.

470. Successful grease making operation begins on drafting board. O. L. Yarham. *Oil Gas J.*, 6.12.54, **53** (31), 119.—Latest developments include use of larger and more powerful grease kettles, mills for multi-purpose lithium-soap-base greases, and employment of continuous or semi-continuous process equipment. G. A. C.

471. How good are the "new" motor oils? C. W. Georgi. *Petrol. Refin.*, 1954, **33** (10), 104–9.—A discussion of the purpose and performance of cross-graded motor oils in deposit control, cyl and camshaft wear, and oil consumption. The general conclusion is that these multi-visc oils are best suited for certain designs of high octane requirement engines, when used in very light duty stop-and-start service. Such oils do not seem to indicate any outstanding benefits in engines of lower octane requirements or in engines used frequently for heavier or cross-country service. R. D. S.

472. Designing performance into motor oil. L. Raymond and J. F. Socolofsky. *Petrol. Refin.*, 1954, **33** (10), 110–15.—Results of some of the work conducted in the development of a new cross-graded oil are described. Attention was concentrated on performance in engines now in service, and arbitrary specifications which imposed undesirable limitations were disregarded. The resulting oil is claimed to give lower wear, increased engine cleanliness, improved fuel economy, and satisfactory oil consumption and starting performance. R. D. S.

473. Additives for petroleum lubricants. F. F. Musgrave. *Inst. Petrol. Rev.*, 1954, **8** (90), 105.—This is now a widespread practice, and includes additives within the following groups: pour-point depressants; detergent dispersants; V.I. improvers; E.P. agents; film strength agents; anti-rust agents; oxidn inhibitors; and anti-foam agents. Notwithstanding all this work on the chemical side, complementary progress has been made on the engineering side by way of improving the design of engines and gears. The main additives used include sulphur, chlorine, phosphorus, zinc, lead, calcium, and barium (combined in organic compounds). Other additives which have been examined are described, and the method of evaluation, both on a short- and long-term basis, is discussed. Likely future developments in testing procedures are indicated, and the effect of additives on bearing surfaces are described. Particular attention is paid to hypoid gear lubrication and to diesel engines. Finally, future developments within the field of lub oil additives are discussed. R. H.

474. Lubrication of gears. 6. Examples of failure in service. Anon. *Sci. Lubric.*, 1954, **6** (7), 12–14.—Illustrations of gear failure due to normal surface fatigue, pitting due to partial oil breakdown, pitting accompanied by scoring due to oil breakdown, results of using a mixture of mineral and vegetable oil, scuffing due to lubricant having inadequate load-carrying capacity, spur gear scuffing from oil starvation, and scuffing of the hypoid, bevel, and spur gears due to inadequate load-carrying capacity. J. G. H.

475. Surface failure in gears. H. Cameron. *J. Inst. Petrol.*, 1954, **40**, 191–5.—Experimental investigations into the formation of oil films between gears and their subsequent breakdown under high loads are discussed. A. R. W. B.

476. Wire drawing lubricants. L. Salz. *Lubric. Engng*, July–Aug. 1954, **10** (4), 190–2.—Wire drawing procedure is briefly described, and the wet and dry methods of lubrication are explained with details of the functions of the various components. The 7 types of wire drawing lubricants commonly used, dry granulated soaps, soap–fat paste compositions, compounded oils, petroleum greases, soluble oils, graphite compositions, and soft metals are enumerated with characteristics and method of use. J. G. H.

477. Aspects of industrial gear drives. T. F. Everest. *Sci. Lubric.*, 1954, **6** (9), 16–19.—The importance of correct alignment between gears in industrial units is stressed, and the necessity for rigidity and adequate bearing arrangements in heavy-duty equipment is emphasized. Correct lubrication is rated as essential for smooth operation, and methods of overcoming shock loading are indicated. Other aspects discussed include the analysis and elimination of noise, and bearing-oil pressures. J. G. H.

478. Planned lubrication at the Steel Company of Wales. 1. H. Harber. *Sci. Lubric.*, 1954, **6** (8), 10–13.—The organization of a lubrication department in a fully integrated steel plant is outlined and the responsibilities of senior personnel indicated. Lubricant storage facilities and distribution routine are briefly described. J. G. H.

479. Lubrication systems for heavy closed die forging presses. W. J. Polny and R. G. Sturm. *Lubric. Engng*, May–June 1954, **10** (3), 151–4.—Lowry 50,000- and 35,000-ton forging presses are described. Size, design, and special operating features of these machines rendered impracticable conventional means of lubrication. The special lubricating systems evolved and the electrical methods of control fitted to these systems are described and illustrated. J. G. H.

480. Lubricants in transport. Anon. *Sci. Lubric.*, 1954, **6** (6), 22–8.—Papers presented at the Institute of Petroleum Summer Meeting are summarized in some detail. J. G. H.

481. Wear in bearings. C. H. Junge. *Bull. Amer. Soc. Test. Mat.*, May 1954 (198), 64–9.—The various types of bearing failure encountered, fatigue, scoring, wiping and seizure, corrosion, and erosion are described in full detail, together with contributory conditions, photographic illustrations, and remedial measures. J. G. H.

482. Laboratory evaluation of metal-forming lubricants. R. S. Barnes and T. H. Cafcas. *Lubric. Engng*, May–June 1954, **10** (3), 147–50.—Increased use of metal-forming processes has resulted in a demand for a lab test unit suitable for the appraisal of metal-forming lubricants. Details are presented of an Instron Tensile Testing Instrument and of the adaptations made thereto to facilitate the testing of metal-forming lubricants. The use of the adapted unit for the testing of aluminium, wire-drawing, brass-rolling, and steel-drawing lubricants is described in detail, and results so obtained are tabulated and discussed. While the usefulness of the unit is somewhat limited by the low speed range, correlation of results here obtained with service experience is considered satisfactory. J. G. H.

483. Reclamation of used oils. 1. E. G. Ellis. *Sci. Lubric.*, 1954, **6** (10), 10–14.—Essential properties in the successful functioning of lub oils are briefly indicated and the advantages of removal of contaminants noted. Factors influencing oil reclamation are discussed, and examples of the efficient reclamation of crankcase oils are presented. Chemical and

physical properties of used oils are noted, and types of contaminants encountered are enumerated. A step by step lab treatment for the removal of contaminants is described and tabulated. J. G. H.

484. Protection of machinery in storage. R. W. Tong. *Sci. Lubric.*, 1954, **6** (10), 19–21.—The importance of adequate protective measures for the care of machinery out of commission is stressed, and procedures for high-speed steam engines in temporary and prolonged storage are presented, together with recommendations for the storage of turbines, oil engines, fuel pumps, and accessories and spares. Other points covered include engineer's and oil stores and the labelling of greased components. J. G. H.

485. Surface-active rust preventives in lubricating oil. D. W. Criddle. *Lubric. Engng*, May–June 1954, **10** (3), 143–6.—The special function of rust-preventive additives in lub oil is discussed and the mechanism of their operation explained, with details of characteristic action of particular additives. A correlation is suggested of spreading properties of an oil over water with rust preventive effectiveness. J. G. H.

486. Properties and requirements of diesel engine lubricants. J. G. Withers. *Schweiz. Arch. angew. Wiss.*, 1954, **20**, 335–41.—Visc characteristics are considered and advantages of low visc oils explained. Min start temp for SAE 5W, 10W, and 20W are respectively −24°, −18°, and −10° C, with max extrapolated visc at −17·8° C of 870, 2600, and 10,500 cs. Mechanical power loss is $\propto$ (visc 98·9° C)$^{\frac{1}{2}}$, increase of oil circulation is $\propto$(visc 98·9° C)$^{-\frac{1}{2}}$; no bearing deterioration will occur, at crankcase temp $\geq$ 80° C, with SAE 5, provided oil pump has adequate capacity. Oil consumption is limiting factor in downward visc trend, consumption of SAE 5W can be 100% up on SAE 30 for engine showing moderate wear. Factors influencing bearing corrosion and sludge formation are discussed, engine (Caterpillar) tests described, and effect of detergents shown; relative sludge-dispersion effectiveness is (Regular = 1): Premium 2, 2–104B 3, Mil-O-2104 4, Supp I 8, Supp II 16. V. B.

BITUMEN, ASPHALT, AND TAR

487. Old and new evaluation scales for bitumen. T. Temme. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (7), 215–18.—The latest issue of DIN 1995 is examined critically, in view of differences in quality of bitumens from various sources, and recent experience. Properties and relevant tests of these bitumens are discussed relative to recent research, and a further revision of DIN 1995 is indicated. R. T.

488. Testing procedures for bitumen emulsions after German and foreign specifications. H. Raudenbusch. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (8), 235–8.—Tests prescribed in DIN 1995, BSS 434, 1952 and 1935, and ASTM 244–9 are compared. The necessity for new collaboration of the countries and greater activity in co-ordinating international procedure are emphasized. R. T.

489. Wet-sand process for preparing bituminous coatings. H. Nüssel. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (8), 239–43.—Theoretical and practical aspects of the process—applied where stone is not available—complementary to above lecture. R. T.

490. Laminated construction or cement concrete as foundation for bituminous coverings on streets with heavy traffic. R. Crantz. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (7), 209–14.—Factors discussed in road construction for heavy traffic are: nature of sub-soil, relative thickness and type of foundation, thickness of bitumen cover, resistance to water pen, and surface cracks. Illustrated types of laminated foundations are discussed and American procedure compared. Avoidance of surface cracks transmitted from the foundation or from superficial causes present a serious problem. Economy must be considered. R. T.

491. Absorption of bituminous materials by stone. A. W. Rick. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (8), 248–51.—An investigation of adsorption and absorption—assumed as a measure of adhesiveness—of bitumens of given composition on equiv surfaces of solid materials. Colorimetric determinations on the filtrates after treating basalt, porphyry, coal dust, fillers of slate and slag, limestone, and schist with 4 bitumen soln in benzene, and 4 tar soln in nitrobenzene, are discussed. Results are given in tables and charts. R. T.

492. The effect of various rubbers on the properties of petroleum asphalts. R. H. Lewis and J. Y. Welborn. *Publ. Rds, Wash.*, 1954, **28** (4), 64.—The use of rubber as an additive to bitumen for road making is traced chronologically and the existing knowledge about its effect upon the properties of bitumen summarized. The authors then proceed, in a well-documented article, to describe their experiments designed to investigate this problem further. Their work, which covers different kinds of powdered rubber (natural and artificial) and different bitumens, shows that the change in properties depends upon: (1) the type and quantity of rubber; (2) the nature of the bitumen; and (3) the way in which the bitumen–rubber blend was prepared. In general, addition of rubber increases soft. pt. and visc, but decreases penetration, temp susceptibility, and tendency to flow. Other properties, including elasticity, ductility (at different temp), and volatility (thin film oven test) were also studied. Practical trials were discussed, and the rubber–bitumen blend recovered and examined in a number of cases, although this was not easy to achieve. Finally, various theories dealing with the mechanism of the blending of these 2 materials are put forward. R. H.

493. A laboratory study of rubber–asphalt paving mixtures. H. M. Rex and R. A. Peck. *Publ. Rds, Wash.*, 1954, **28** (4), 91.—A limited investigation into rubber–bitumen–aggregate mixtures has shown that: (1) rubber added as a powder reduces the compactibility of such a mixture; (2) pre-blending the rubber with the bitumen tends to improve the compactibility; (3) there is a relationship between the properties of these asphalts and the constituent rubber–bitumen blend; (4) the rubber imparts no increase in plasticity, nor of resistance to water. Full details of the different rubbers used are included. Techniques used include the California abrasion test and the (ASTM) immersion–compression test, detailed results being included. During the discussion of the problem, mention is made of the difficulty in assessing whether the rubber is merely acting as a filler or whether the binder is really a rubber–bitumen complex. R. H.

494. Industrial utilization of Ragusa asphaltic rock. G. Coppa-Zuccari. *Chim. et Industr.*, 1954, **72**, 1037–40.—Rock (oil content 7–8%) is opencast mined and oil extracted in ovens where 20–25% is burnt, 60–70% recovered (300–350 tons/month), and 10% left in rock as fixed C. Residual rock fed to cement works; of oil recovered most is now used as fuel in installation, but increasing proportion is made into blown bitumen for roads. Flow sheet given. V. B.

495. Newer development of road tars. H. Mallison. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (7), 206–8.—A critical examination of specification DIN 1995 for road tars—regarded as cutback soft pitches—is presented with supporting data. A new scheme for analytical investigation of road tars gives a clearer picture than the prescriptions of DIN 1995. The difference between tars of different setting rate is especially evident. In the new scheme revision of DIN 1995 is suggested, with particular attention to visc (E.V.T.), fractional dist, effect of the anthracene oil fractions, and conversion of the pitch yield to soft. pt. 67°. R. T.

SPECIAL HYDROCARBON PRODUCTS

496. Operational assessment of insulating oils. T. Salomon. *Bull. Soc. franç. Elect.*, 1954, **4**, 570–600.—Oil oxidn mechanism simpler for oils in service than in laboratory ageing test;

acid formation followed by sludge, both these oxidn stages, which alternate, show discontinuities due to selective oxidn susceptibility of different mol aggregates. Oil stability and condition of oils in service assessed by shape of time–sludge curve; for oils for which first stage of oxidn (acidity formation) is concluded, and sludge about to deposit, this is linear, for other oils curve is parabolic; in former case extent to which ageing has progressed is indicated by point of intersection of curve with abscissa (duration of laboratory ageing). Total amount of sludge formed by any given aggregate is const and depicted by linear portion of curve; rate of such sludge formation indicated by parabolic portion, and increases with preheating of oil or with arduous service conditions. Effect of factors influencing service ageing (type of transformer, operation, nature of oil) is discussed; results of laboratory assessment of numerous used oils is given. New oils can safely be mixed, stability will not be inferior to that of worst component. Mixing of new and used oils could lead to sludge pptn. All laboratory tests by Weiss–Salomon procedure (115° C, Cu cat, in air, ppt sludge from acetone extract of aged oil by *n*-heptane), this, and method of assessing oils from service, is described in detail; interpretation of results to estimate residual life of oil is explained. V. B.

497. Influence of gas content on the dielectric behaviour of insulating oils. H. H. Bucholz. *Elektrotech. Z.* (*A*), 1954, **75**, 763–8.—Gas solubility determination (760 mm, 20° C) gives for air *ca* 11 vol % in transformer oil and *ca* 6 vol % in visc cable oil; literature data on gas solubility in elec oils is tabulated. Elec strength tests (apparatus described) on degassed, air-saturated, and H_2-saturated cable oil, give smooth V–temp curve for degassed oil, but irregular curves for gas-containing oil, due to gas separation under joint influence of temp and elec field. Similar tests (but in different apparatus) on transformer oil show no effect on elec strength if gas soln is by surface diffusion, but gas separation can occur if gas is introduced by agitation or with fibrous contaminants, such coarse gas distribution lowers elec strength of oil. Gas separation under influence of elec field examined, such gas separation occurs only below 550 mm for trans oil, and affects elec strength at reduced pressure; in more viscous oil some formation of gas nuclei can occur at atm pressure under elec stress. Dissolved gases have no effect (at up to 100 kV/cm) on p.f. of cable oil. Oscillograph tests indicate that ionization and space charge effects occur in gas-containing oils, which can then show stress-dependent loss-creating capacitive resistance. Vacuum impregnation of equipment, in order to degas oil, is fully justified. V. B.

498. Experimental investigation of behaviour of transformer oils in presence of air and of nitrogen. G. H. Perrin. *Bull. Soc. franç. Elect.*, 1954, **4**, 607–11.—Oils maintained in steel containers (150 mm dia, 250 mm ht) for 8 months at 105° C. 4 parallel tests, new oil in new container; oil pre-oxidized by few days heating at 150° C, in new container; new oil in container containing sludge on walls (in these 3 tests container is open to air), new oil in container kept under N_2 pressure. Periodic test for neut. val, visc, dielectric strength. For all tests oil under N_2 showed little change, remaining oils showed deterioration in all characteristics, much more pronounced for pre-oxidized oil than for others; effect of soiled as against new container not very marked. Types of equipment for maintaining N_2 atm in transformers briefly described. V. B.

499. Inhibited transformer oils. W. R. Stoker and C. N. Thompson. *Bull. Soc. franç. Elect.*, 1954, **4**, 612–27.—Inhibitors can be cat passivators, cat deactivators, oxidn inhibitors, or indirect anti-oxidants (forming one of preceding groups after initiation of oxidn). Oxidn inhibitors are preferred type, as action is independent of presence of metal. Assessment of inhibited oils is discussed, standard transformer oil oxidn tests are too short, as their duration < induction period of inhibited oil. Induction period measurement (O_2 absorption, 120° C, Cu cat) is preferred procedure, either research method (*cf.* Abs. **1071**, 1951) or shorter control test (*cf.* Abs. **1268**, 1951). Good inhibited oil should show negligible sludge and acidity in BS 148/51 ageing test. Results (acid val, sap val, winding temp) are given of comparative trials of straight and inhibited oils in simulated transformers (110°–130° C, 9000 hr) and in 7-kVA transformers (85°–90° C, 13,000 hr). Inhibited oils can be purified (strong adsorbents excepted) and safely mixed with either other inhibited or with straight oils. Determination of induction period of inhibited oil is suitable check on its extent of deterioration (and can also be used as sensitive test for effect of varnish constituents on oil). When inhibitor is spent, oil oxidizes similarly to straight oil. Inhibited oils are especially suitable for highly-loaded inaccessible distribution transformers. V. B.

500. Effect of dielectric loss of oil on transformer insulation. M. A. Gladkikh. *Elekt. Stantsii*, 1954, (3), 26–7.—Oils withdrawn from transformers showing poor insulation characteristics had high p.f. (average 0·07/70° C, max >0·6). Refilling transformers with new oil (average p.f. 0·02) restored insulation to normal values. Chemical examination of oil gave no clue to its increased p.f. V. B.

501. Post-nationalization oil analyses on high-power high-voltage transformers of the Electricité de France grid. C. Dietsch. *Bull. Soc. franç. Elect.*, 1954, **4**, 601–6. Total transformers operating at ≥90 kV represent capacity of 13,000 MVA and contain 20,000 tons oil. Regular tests (bi-annual) made for neut. val., IFT, sludge, and (semi-annually or annually) dielectric strength. For neut. val max val found for 90, 115, and 220 kV groups were 0·30, 0·42, and approx 0·5; annual increment being 0·01–0·016; even after 20 years service some 220 kV equipment had oils with neut. val <0·23. Results of IFT measurements indicate correlation with neut. val for range 0·2–0·6 of latter; sludge results were somewhat inconclusive, although figure of 0·2% (125 hr at 150° C) seldom exceeded for 115–220 kV equipment. Older transformers tend to run cooler than newer, due to design changes; pre-war equipment averages 2 tons oil per MVA, post-war 1 ton. Since 1947 only one transformer (installed 1922) failure (0·02% of total capacity) attributed to sludge formation. V. B.

502. Regeneration of oil from a high tension Pirelli type cable. G. Tinel. *Bull. Soc. franç. Elect.*, 1954, **4**, 553–6.—Details of overloaded 1·7 km sector of 60 kV cable in which oil had seriously deteriorated (*cf.* Abs. **262**, 1955). Cable flushing procedure (occupying 6 months) is described and results of electrical tests on oil and cable are given. V. B.

503. Regeneration of oil having high dielectric loss. E. P. Kul'pina and Yu. V. Petrov. *Elekt. Stantsii*, 1954, (3), 28–9.—Transformer oil after 3 years service, which had high p.f. (up to 0·6/70° C), was successfully regenerated (0·002–0·005) with 7% bleaching earth. 3% silica gel had no effect. Acidity of oil bears no relationship to its p.f. V. B.

504. German Standards. Standard petroleum spirit. Anon. *Erdöl u. Kohle*, 1954, **7**, 753.—Draft specification; colourless, 65°–95° C (*ca* 85% at 90° C), <2% absorbed by H_2SO_4, an. pt. 59°–61° C, sweet, certification by approved lab. required. V. B.

DERIVED CHEMICAL PRODUCTS

505. Chemicals from petroleum. G. Egloff. *Erdöl u. Kohle*, 1954, **7**, 710–17.—U.S. petrochem investment 83×10^9; estimated 7×10^9 by 1960. Present production 9 m tons; estimated 1964 30 m, representing half U.S. chemicals. Main processes, based on CH_4 (including C_2H_2 obtained therefrom), C_2H_4, C_3H_8, C_4H_{10}, and aromatic hydrocarbons, are outlined. V. B.

506. New phase develops in petrochemicals. B. T. Brooks and E. B. Brien. *Petrol. Engr*, 1954, **26** (10), C7–10.—The

factors influencing recent price declines for petrochemicals are analysed. It is suggested that these factors are sharpened competition and improved technology. Research expenditure is essential for progress. J. B. S.

507. Liquid petroleum gases for petrochemicals. H. A. Mitchell. *Petrol. Engr*, 1954, **26** (10), C53–5.—The probable demand for propane and butane is examined, based on the many uses of propylene and ethylene. The derivatives of ethylene and ethylene oxide are also discussed in light of present and future demand. J. B. S.

508. Pesticides from petroleum. M. Sittig. *Petrol. Process.*, 1954, **9** (11), 1755–8.—An estimated 75 million gal/year of petroleum are used as pesticides or solvents for other organic pesticides. The pesticide industry produces 1000 million lbs of chemical annually, consisting of 500 million lb of sulphur and 300 million lb chlorinated insecticides. The syntheses of a number of important insecticides, fungicides, and herbicides are examined to see how petroleum-based raw materials can be used in their manufacture. The use of petroleum products as solvents for insecticides sometimes produces an effect more potent than the sum of their individual actions. J. H.

509. Partial oxidation of ethylene. P. W. Sherwood. *Petrol. Process.*, 1954, **9** (10), 1592–7.—Statistics show in the first weeks of Aug. 1954, the recovery of the ethylene oxide market from a temporary slump. In the partial oxidn of ethylene, direct oxidn is favoured over chlorohydrivation. Production capacity is increasing on a faster scale than demand. By the end of 1955, production is estimated to be 1065 million lb/annum. Information is given concerning the effect of process variables. A comparison is made between fixed-bed and fluidized reactors. 21 refs. J. H.

510. From natural gas to acrylonitrile. D. P. Thornton. *Petrol. Process.*, 1954, **9** (10), 1589–91.—A new $50 million plant designed to produce 50 million lb of acrylonitrile annually from natural gas and air will be on stream shortly by American Cyanamid Co. Acrylonitrile will be produced by the reaction of pure acetylene with 50% HCN and steam in the presence of a liq cat, at atm pressure and moderate temp. J. H.

COAL, SHALE, AND PEAT

511. Combustion rate of coal shale. L. J. Hillinckx. *Chem. Engng Sci.*, 1954, **3** (5), 201–8.—In a theoretical and experimental paper on the combustivity of mainly coal shales, some results were also obtained for oil shale. The accessibility of oxygen to the combustible carbon burning surface in these essentially waste products governs the combustion rate. Values are quoted for the diffusivity of oxygen through the residual porous material left by the combustion. E. A. G. H.

CORROSION

512. Corrosion in the petroleum industry. Pt 1. F. H. Garner and A. R. Hale. *Petroleum, Lond.*, 1954, **17** (11), 407–10.—Electrochemical corrosion takes place below 500° F due to H_2S expelled from the crude on heating and HCl formed by hydrolysis of metallic chlorides. Above 500° F attack by sulphur compounds occurs which can be overcome by using chromium steels. In the cooler sections corrosion due to acid gases and water can be resisted by non-ferrous metals, *e.g.* monel usually used as cladding or lining material on mild steel. J. B. S.

513. Sea water as an industrial coolant. Pt I. Operating conditions. W. B. Brooks. *Petrol. Refin.*, 1954, **33** (10), 127–30.—A discussion of the types of corrosion likely to be encountered in the large scale use of sea water as a coolant, under conditions ranging from near stagnation to high velocity and great turbulence. Methods of controlling some of these types are also discussed. R. D. S.

514. Vapour-zone corrosion in sour-crude tanks. A. H. Newberg and J. P. Barrett. *Oil Gas J.*, 15.11.54, **53** (28), 189.—Vapour-zone corrosion can be controlled by design, use of resistant materials, inhibitors, or coatings, either separately or in combination. Use of coatings is economically attractive, if correct material used, but rigid inspection of all phases of the work is necessary. G. A. C.

515. Early stages of fretting of copper, iron, and steel. D. Godfrey and J. M. Bailey. *Lubric. Engng*, May–June 1954, **10** (3), 155–9.—Early stages of fretting corrosion were investigated in a special apparatus at Lewis Flight Propulsion Lab NACA. The apparatus and procedure employed are described and illustrated. It was found that in the early stages surface damage starts with severe adhesion, which initiates other wear phenomena. Such adhesion often results in ploughing, and small wear fragments rather than larger ones result in the early formation of oxide debris. The importance of different wear phenomena was found to vary with the materials fretted, and these varying phenomena can occur simultaneously at different points within the contact area. J. G. H.

ENGINES AND AUTOMOTIVE EQUIPMENT

516. Turbocharging 2-stroke gas engines. C. A. Chamberlain and G. H. Bollman. *Pipe Line News*, Oct. 1954, **26** (10), 37–42.—Turbocharging, which utilizes the energy of the exhaust gases to supply scavenging air to the cyl, decreases the fuel consumption and heat load of the engine without increasing the load on the crankshaft. B. A. F.

SAFETY PRECAUTIONS

517. Nuisance control and U.K. refineries. Anon. *Petrol. Times*, 26.11.54, **58** (1495), 1229.—Extracts are given from the 90th "Annual Report on Alkali Works, etc., by the Chief Inspectors for the Year 1953." The problem of smoky flames and flares at refineries, extent and efficiency of gas washing at Battersea Power Station and the new Bankside plant are among subjects dealt with. G. A. C.

518. Oil jetty foam monitor. Anon. *Brit. Petrol. Equipm. News*, 1954, **4** (1), 38.—Some facts are given concerning a foam monitor for the protection of oil jetties in the case of fire. Monitors are carried by steel towers strategically placed, and fed by pipeline with water and Airfoam Liquid. E. A. G. H.

519. Fire precautions at Grangemouth. Anon. *Petrol. Times*, 10.11.54, **58** (1496), 1290.—The fire service arrangements at the Grangemouth refinery of the British Petroleum Co are described. Location of extinguishers, fire warnings, mobile equipment, and setting of hydrants are discussed. G. A. C.

520. Analysis of accidents during work in the oilfields. A. Waliduda. *Nafta (Krakow)*, 1954, **10**, 18–20, 43–5.—Work in the oilfields was subdivided into following branches: (1)

roads, drainage, etc; (2) building; (3) drilling; (4) production; (5) power supply; (6) transportation; (7) smithies and workshops; (8) others. 35% of all accidents occurred during drilling, only 0·4% in drainage work, etc. Of the first *ca* ½ during actual drilling (10·5% of absolute total) and ½ during handling of pipes. Reasons for this are disregard of instructions, leaving off protective clothing, untidiness, neglecting inspection of equipment immediately before use, and inadequate use or lack of mechanical lifting equipment. A fair number of accidents in the smithies and workshops of their total of 18% was due to carelessness and lack of inspection. By comparison with U.S.S.R. a greater degree of mechanical handling would be required, as well as revision of instructions. Also required are tighter control of use of protective clothing, accent on tidiness, inspections, and prizes for accident-free work. *Ca* 50% of accidents could be avoided. More than ½ of all accidents occurred to semi-skilled workers.
M. S.

MISCELLANEOUS

521. European refining capacity reviewed. Anon. *Petrol. Times*, 12.11.54, **58** (1494), 1172.—A map showing the expected refinery throughput capacity in W. Europe at the end of 1954 illustrates the article and tables show European refinery capacity, comparison of U.K. oil imports and exports, and W. European refinery capacity at end of 1953. G. A. C.

522. (Polish) petroleum industry on the threshold of 1954. J. Drzewiecki. *Nafta (Krakow)*, 1954, **10**, 1–2.—Realizing the key position of the petroleum industry, the P.R. Congress stressed the efficiency and economy campaign. In detail the objectives include a cut in experimental (geological) drilling from 28·5 to 10%, 10% increase in speed of drilling, to aim the geological survey at 20% increase in resources, cut waste of materials by *ca* 2%, and raise efficiency by *ca* 6%. Scientific and educational liaison should become closer. Secondary production must be increased. M. S.

523. Tasks of the (Polish) petroleum industry for 1954. Anon. *Nafta (Krakow)*, 1954, **10**, 25–6.—In the 5th year of the 6-year plan the (Polish) petroleum industry must aim at: (1) maintaining production of crude at the 1953 level of 229% of 1949 production (against 283% planned); (2) raising production of gas by 8·8% to 246·8% of 1949 value. The first requires the gaining of an extra 8000 tons to offset the natural decline. Geological drilling must be speeded up by half to allow extra 12·5% of total time to be used for productive drilling. Greater production of bits is needed and also economy in use of pipes. Refining industry produced in 1953 295% of its 1949 value against 206% originally aimed at from only 232% of crude used in 1949. Elimination of all waste and reduction of overtime work is required for 1954. M. S.

524. OEEC interim 1954 report on development of refinery capacity and utilization trends. F. Blücher. *Erdöl u. Kohle*, 1954, **7**, 773–8.—Data given for 1952–53, estimates for 1954–56. Figures (millions of tons) for 1953 and 1956: inland consumption, 64·9, 77·5; bunkers 9·7, 10·5; dist capacity, 100·4, 112·3; refinery throughput, 81·8 (6% indigenous), 98·0. Tables give (for atm products and fuel) major uses by individual countries. V. B.

525. Fire research 1953. Anon. *Petroleum, Lond.*, 1954, **17** (10), 365–9.—Reports of tests on spontaneous heating and ignition in textile oils and pulverized iron pyrites are given. A study has been made of effect of tube dia upon limits of inflammability of methane, ethylene, ethylene oxide, and dimethyl ether. Vaporizing liq extinguishing agents, *e.g.* trifluorobromethane, have been tested with regard to toxic hazards and efficiency. The use of water sprays and nature of the spray in oil fires has been investigated. Further work has been carried out on base injection of foam into petrol storage tanks. J. B. S.

526. The cost of fighting smog. C. Pollak. *Petrol. Process.*, 1954, **9** (10), 1567–9.—From information from 8 major refiners in the Los Angeles area, the fight against smog will have cost the petroleum industry $25 million by May 1955. Of the total sum, $21 million will be given for research, SO_2, and hydrocarbon vapour control. The remaining money will be invested in vapour recovery systems. J. G. H.

527. Present position of Belgian standardization of petroleum sampling and test procedures. F. P. Malschaert. *Rev. univ. Min.*, 1954, **10**, 206–12; *Chim. et Industr.*, 1954, **72**, 937.—Committee is now revising 1933 lubricant standards. Preliminary report reviewed, completion is expected by mid-1955. V. B.

528. Fire-fighting equipment for bulk users of lubricating and electrical oils. 2. G. H. Clark. *Sci. Lubric.*, 1954, **6** (6), 12–14, 16, 18.—Fire-pumps, both mechanically and manually operated, and portable extinguishing appliances are described in detail, together with smothering equipment of the carbon tetrachloride, carbon dioxide, foam, and dry chemical types. J. G. H.

529. Safety lighting in hazardous atmospheres. Anon. *Sci. Lubric.*, 1954, **6** (8), 26–8.—Difficulties encountered in the control of electrical equipment in hazardous atmospheres are remarked, and the new pressurized system introduced by General Electric Co, which is claimed to eliminate dangers arising from contact with inflammable gases or vapours, is described in some detail. A typical refinery installation is described, and applications of the system to the housing of non-flameproof meters in glazed cases are indicated. J. G. H.

530. Mineral oil and fuel standardization. C. Zerbe. *Erdöl u. Kohle*, 1954, **7**, 655–8.—List given of all German standards for petroleum products and test methods, with progress report on status of individual standards. It is proposed shortly to issue all these in a single vol, with necessary comments and explanations (*cf* Abs. **1500**, 1953). V. B.

BOOK REVIEWS

Fundamentals of Electric Log Interpretation. M. R. J. Wyllie. New York: Academic Press, 1954, pp. x + 126. $3.60.

The theory of borehole log interpretation and the techniques employed in obtaining the various logs have progressed extremely rapidly over the past decade. The rapid advance in knowledge has produced a vast quantity of literature dealing with various aspects of the subject.

Any newcomer to the field or non-specialist worker must therefore find it a tedious and almost impossible task to disentangle the essential basic principles of log interpretation from the quantity of material available. Such a task would, in fact, be virtually impossible without intelligent guidance from a specialist in the work.

The author of this book is an expert with a wide experience of the subject, well known for his many contributions to log interpretation, theory, and technique, and, therefore very well qualified to act as a guide to the non-specialist learner. The book has been written with this aim, and has been produced in a very convenient size. It recapitulates

the basic principles of electric log interpretation concisely and with a minimum of repetition from existing handbooks on the subject.

The book is divided into two main parts, dealing firstly, with the theory, and secondly, with the practice of quantitative log interpretation, which involves obtaining the necessary theoretical data from both spontaneous potential measurements and the resistivity logs. A minor criticism in this connexion is that the discussion of the theory of spontaneous potential logging given in Pt II could perhaps have appeared with advantage in Pt I, making this completely complementary to Pt II.

The first part is almost entirely devoted to a discussion of the various factors affecting the flow of electric current through earth formations. These include the salinity and temperature of the interstitial water, rock structure, the presence of oil or gas, and the presence of conductive solids (clays).

The second part of the book is extremely comprehensive. Quantitative interpretation of the spontaneous potential curve is quite rightly discussed in greater detail than the quantitative interpretation of conventional resistivity curves, which the author considers is fully dealt with in a Schlumberger handbook on the subject. There is an excellent discussion of the various advantages of the more modern resistivity logging systems using focused current paths. The clear statement of the optimum conditions for the use of each of these systems will be of the greatest assistance to the non-specialist worker on site, and in particular to the mud engineer.

Radio-activity logging receives only very brief attention in an otherwise excellent chapter on the determination of formation factor, which is of fundamental importance in electric log interpretation. This is somewhat surprising in view of the growing importance of this form of logging. For example, there is no mention of the widespread practice of calibrating the neutron log deflection against porosity. Presumably the author has good reason for confining his remarks in this connexion to a qualitative method of combining neutron and resistivity log data. Much has been written on the subject, and a little more discussion of the various procedures would have been helpful.

A set of graphical solutions to the various equations used in quantitative log analysis is given in the appendix. Experimental Graph No. 7, which gives the probable minimum average permeability that a formation could have, from log data, appears to be somewhat out of place in a work of this description.

The book will be invaluable to anyone wishing to understand the basic principles of electric log interpretation. In addition, an excellent bibliography is given, which, together with the various publications referred to in the text, provides an extremely good basis for further information on the various aspects of the work, should this be desired. It is to be hoped that the author will follow it up with a comprehensive volume intended primarily for the logging specialist.

P. T.

Wachs-Enzyklopädie. Vol. I: Waxes and their Important Properties. L. Ivanovszky. Augsburg: Verlag für chemische Industrie H. Ziolkowsky KG., 1954. Pp. 232. DM. 11.

There are, as the author remarks in his preface, surprisingly few books devoted to the important subject of waxes, and the appearance of a new one is therefore something of an event. This is particularly so when the author is so well-known an authority on the subject, and has himself contributed so much to the science and technology of waxes, as Dr Ivanovszky.

The volume now published is the first of a 2-volume work, the second of which (dealing with the Analysis and Technology of Waxes) should appear later this year. The first volume is divided into 3 parts. The first discusses the classification, occurrence, and production of waxes, and the second part the physical chemistry of waxes. The term wax is interpreted widely and includes petroleum and other mineral waxes, animal and vegetable waxes, and the numerous synthetic waxes of the ester, alcohol, amide, chlorinated, and polymeric types. Part 3 is concerned with the important subject of retention, which Dr Ivanovszky has done so much to clarify.

The discussions on all these subjects are full and clear and there is no doubt that this book will become a standard reference on waxes, although some British readers may regret that it is published in German. The book is well printed and produced and (an important matter in such a work) well indexed. It can confidently be recommended to all those interested in the technology of waxes. E. B. E.

ADDITIONS TO THE LIBRARY

British Standards:

B.S. 949 : 1951. Addendum No. 1. Unified Thread Taps. Pp. 45. 7*s*. 6*d*. net, post free.

B.S. 1428 : 1954. Pt J 1. Micro-electrolytic apparatus. Microchemical apparatus. Group J: Electrolytic Accessories. Pp. 8. 2*s*. net, post free.

B.S. 2519 : 1954. Glossary of Terms and Notation for Toothed Gearing. Pp. 42. 6*s*. net, post free.

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ABSTRACTS

	PAGE
Oilfield Exploration and Exploitation	
Geology	59 A
Geophysics and Geochemical Prospecting	59 A
Production	60 A
Oilfield Development	60 A
Transport and Storage	60 A
Refinery Operations	
Refineries and Auxiliary Refinery Plant	60 A
Distillation	61 A
Absorption and Adsorption	61 A
Solvent Extraction and Dewaxing	61 A
Cracking	62 A
Hydrogenation	62 A
Chemical and Physical Refining	62 A
Refinery Operations (*cont.*)	
Special Processes	62 A
Metering and Control	62 A
Products	
Chemistry and Physics	63 A
Analysis and Testing	63 A
Gas Oil and Fuel Oil	64 A
Lubricants	64 A
Bitumen, Asphalt, and Tar	64 A
Coal, Shale, and Peat	65 A
Miscellaneous Products	65 A
Corrosion	66 A
Engines and Automotive Equipment	66 A

AUTHOR INDEX

The numbers refer to Abstract Numbers

Adam, H. D., 613
Akers, W. W., 553
Andrault, J., 565
Arkhangel'skii, V. A., 538

Bacon, N. P., 558
Balekjian, G., 556
Banmann, G. P., 570
Banner, E. H. W., 573
Barnes, K. B., 542
Bashkirov, A. N., 572
Becker, W., 597
Bielak, E. B., 581
Blouri, B., 584
Bowden, A. T., 617
Brachetti, E. B., 607
Bratzler, K., 585
Brooks, W. B., 557
Brusset, H., 586
Burgoyne, J. H., 593

Calderwood, G. B. N., 581
Chahveikilian, E., 586
Clark, G. H., 596
Cornell, P. W., 569
Coussemant, F., 578
Cox, H. R., 617

Dahmer, K., 600
Davies, A. W., 614
Davtyan, N. A., 608
Drinkwater, J. W., 590
D'yakova, M. K., 608

Fred, M., 594

Galegar, W. C., 583
Garner, F. H., 611
Gough, B. H., 559

Hale, A. R., 611
Harber, H., 595
Harper, R. C., Jr., 580
Hawthorne, W. R., 617
Heinrich, F. J., 587
Hoffmann, H., 599
Hormaday, G. F., 568
Huntington, R. L., 583

Insall, A. J., 590

Johnson, A. L., 551
Johnson, F. B., 588
Jungers, J. C., 578

Katz, D. L., 556
King, R. O., 615
Kleemann, H., 585
Kornfeld, J. A., 543

Langhein, W., 576
Litchfield, W. H., 569
Loktev, S. M., 572

McLaren, J., 555
Mallison, H., 605
Mardles, E. W. J., 581
Mason, P. W., 574
Meltzer, L., 606
Metzendorf, W., 604
Miller, H., 541
Morbeck, R. C., 566
Mortlock, D. H., 550
Müller, H. E., 598

Nedelmann, H., 603
Newitt, D. M., 593

Obolentsev, R. D., 571

Pollard, A., 560
Porges, F. B., 545
Putscher, R., 594

Ramsey, R. P., 618
Rand, M., 615
Ratliff, R. A., 563
Reman, G. H., 582
Rick, A. W., 601
Ripple, C. W., 562
Riseman, J., 580

Sandona, O. J., 562
Sarjant, R. J., 558
Schmeling, F., 548
Smith, D. T., 537
Smith, G. H., 549
Smith, M. R., 570
Stanton, J. P., 589
Stewart, D., 549
Stokes, M. A., 619
Stovall, W. B., 583
Stranch C. B., 539
Strobel, W. B., 563

Thevenin, R., 602
Thomas, A., 593
Thomson, A. G., 547

van Winkle, M., 561
Vaughan, H. M., 569

Wade, D. E., 553
Walker, A. O., 589
Welsh, R. J., 617
Wheeler, R. W., 610
Wiley, E. M., 579
Wilke, H., 567
Williams, F. S. G., 546
Willig, E., 564
Winterbottom, J. J., 544
Wood, R. E., 588

Young, E. H., 556

OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

531. Dry basins promising. Anon. *Oil Gas J.*, 27.9.54, **53** (21), 57.—The first oil has been found in the Dalhart basin and the Raton basin in the Mid-Continent area of the U.S.A. The Dalhart well, 12 miles SW. of Hartley, Texas, produced *ca* 126 brl oil in *ca* 33 hr from Pennsylvanian granite wash at 6174–6186 ft. The Dalhart basin lies between the Anadarko basin and the Sierra Grande–Las Animas uplift. In the Raton basin, west of the uplift, a 50-ft section of stained Cretaceous Dakota has been cored. C. A. F.

532. Cuban play spreads. Anon. *Oil Gas J.*, 30.8.54, **53** (17), 65.—Exploration in Cuba is being intensified after the discovery of 14°–15° oil at 100–120 b.d. in the Echevarria wildcat *ca* 3 miles N. of Jatibonico. This is the first well in Cuba to have produced oil in the southern part of the island. Areas of particular interest include the Jatibonico and Cauto basins of Oriente Province and the Cienaga de Zapata section on the S. coast of Matanzas and Las Villas Provinces. C. A. F.

533. Australian gas flows. Anon. *Oil Gas J.*, 27.9.54, **53** (21), 62.—Drilling in Australia is briefly reported. Gas has been found at 447 ft at Reid's Dome, nr Springsure; at Roma, 200 miles S. of the Dome, a flow of 870,000 cu. ft. gas was found in the fourth well; Rough Range 1 is drilling below 10,000 ft. Rough Range 2 was abandoned at 4079 ft, and the third well is drilling. C. A. F.

534. French offset completed. Anon. *Oil Gas J.*, 30.8.54, **53** (17), 63.—A second producing well has been completed in the Parentis field 44 miles SW. of Bordeaux; on test the well produced *ca* 1960 b.d. from 7750 ft. It is suggested that Parentis may prove to be the largest oilfield in Europe. A well on the Bray anticline near Beauvais is reported to have found oil in Jurassic limestone. C. A. F.

535. Spanish test begun. Anon. *Oil Gas J.*, 30.8.54, **53** (17), 63.—A well is being drilled at Castilfrio on the Oncala anticline, which is a surface structure *ca* 15 miles NE. of Soria. There is also drilling in the Pyrenees, where an anticline is being tested near Boltana. C. A. F.

536. North Spain tested. Anon. *Oil Gas J.*, 4.10.54, **53** (22), 123.—A well is being drilled below 4000 ft on the Oncala anticline, which is a surface structure nr Soria, NE. of Madrid. Surface beds are Lower Cretaceous sandstones, and an unsuccessful test has been made at *ca* 4500 ft in dolomitic limestone. C. A. F.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

537. Geophysical methods of prospecting. Pt II. Gravitational methods. D. T. Smith. *Petroleum, Lond.*, 1954, **17** (12), 426–9.—A gravitational method of prospecting produced the first oil structure to be discovered in the U.S.A. by any geophysical means, and although this method has been largely superseded by other geophysical activities, it still plays an important part in the search for oil. Various techniques employed in this type of prospecting are described, and the general principles upon which they are based are also outlined. J. B. S.

PRODUCTION

538. Application to calculation of the unstable filtration of gas-charged crudes of the method of changeable stationary states. V. A. Arkhangel'skii. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk*, 1954, (7), 133–45.—Problem of the unstable filtration of gas-charged crude cannot, strictly speaking, be solved. At present this problem is investigated by the method of changeable stationary states, in which the values for the discharge of gas and of crude, and consequently the gas factor, are assumed, for a given instant, to be the same for the entire cross-section of the filtering flow. An evaluation of the errors introduced by such an assumption can be made by comparing the figure obtained by the method of changeable stationary states with a solution of the equation for the unstable filtration by the method of finite differences.

(Author's summary.)

539. Permanent-type well completions. C. B. Stranch *et al. Oil Gas J.*, 23.8.54, **53** (16), 129.—Permanent-type well completion is briefly described, in which tubing and well head are installed only once in the life of the well, all subsequent work being carried out by wire line through the tubing. In a permanent completion open tubing is run in and set above all possible productive zones, and mud is displaced with salt water or oil. The method has many advantages, including longer life of well equipment which remains *in situ*, and the reduction in work-over costs by eliminating the use of heavy and expensive hoisting equipment. 4 refs. C. A. F.

540. New Spraberry approach. Anon. *Oil Gas J.*, 4.10.54, **53** (22), 118.—An experimental 5-spot normal water flood is planned for a lease in the Spraberry sand of W. Texas. Lab experiments have indicated that the Spraberry could be effectively flooded by conventional methods, provided that the width and frequency of fractures are favourable. The lease contains 1320 productive acres at present supporting 6 wells averaging 31 b.d. Salt water for injection could be obtained from the San Andres at *ca* 4500 ft above the Spraberry. C. A. F.

541. Gas injection improves recovery of Salt Creek's low-gravity oil. H. Miller. *Oil Gas J.*, 27.9.54, **53** (21), 74.—The development and results of unitization and gas injection in the Salt Creek Field, Kern County, California, are briefly described. There is one pay zone, the Miocene Carneros sand, which pinches out in the field. The structure is complex, consisting broadly of an anticlinal nose divided by numerous faults which serve as fluid barriers. The field was discovered in 1946, and unitization was realized in 1948, one year after development had been completed; gas injection started in Dec. 1948. A series of maps show reservoir pressure distribution, gas–oil ratio distribution, and water distribution for the field at the start of injection, compared to present conditions. Controlled production and injection have allowed a secondary gas cap to form high in the structure, and water has advanced along a uniform front. C. A. F.

OILFIELD DEVELOPMENT

542. Loudon project paying off as Big Flood expands. K. B. Barnes. *Oil Gas J.*, 30.8.54, **53** (17), 50.—The Loudon oilfield in Illinois, discovered in 1937, is producing 17,700 b.d. from Chester Cypress sand, which is being water flooded; 8500 b.d. is directly attributable to the water drive. The Cypress occurs at a depth of 1500 ft, and there are 20,000 productive acres, which have yielded to date 176 million brl. The field trends north–south, 15 miles by 4 miles. The water flood was started in 1952, and the anticipated result is an increased recovery of 100 million brl. Important water flooding operations are being carried out elsewhere in Illinois. C. A. F.

543. Curtis sand development stimulates drilling at Grass Creek, Wyoming. J. A. Kornfeld. *Oil Gas J.*, 23.8.54, **53** (16), 204.—Development of Trias Curtis sand production in the Grass Creek field in the Big Horn basin, Wyoming, is described. Daily production from this zone is 7000 brl from 150 wells, compared with 800 b.d. from the Frontier and 6000 b.d. from Embar–Tensleep. The field was discovered in 1914, when Frontier pays were found at 900 ft, and Embar–Tensleep pays were first discovered in 1922. Initial production rates from the Curtis are low, and wells are fractured with sand–oil, which gives an increased output of 20–300%. It is suggested that the Curtis may produce over a wide area in the basin. C. A. F.

TRANSPORT AND STORAGE

544. Tanker surplus continues to increase. J. J. Winterbottom. *Oil Gas J.*, 27.12.54, **53** (34), 194.—Delivery of tankers in 1954 left a surplus at end of year equivalent to 263 T-2 tankers, as compared with 86 T-2 at end of 1953. Tables show estimated tanker requirement, tonnage availability, age, under construction, and deliveries to date. G. A. C.

545. New pipelines for Europe's booming needs. F. B. Porges. *Oil Gas J.*, 27.12.54, **53** (34), 206.—The Le Havre–Paris (France), Hemmingstedt–Brunsbuettelkoog (Germany), and Genoa–Rho (Italy), pipeline routes and operational features are described. The French line is to carry fuel oil and gasoline; the German lines are for crude oil and finished products; and the Italian line is for crude oil. G. A. C.

546. A.S.A. code for pressure piping. F. S. G. Williams. *Mech. Engng, N.Y.*, 1954, **76** (11), 897.—The history of A.S.A. and its functions are outlined. T. T.

547. Rigid P.V.C. piping: its manufacture and use. A. G. Thomson. *Fluid Handl.*, Dec. 1954, **5** (59), 323.—Rapid strides are being made in the development of extruded rigid polyvinyl chloride piping. A 1000-ft section of P.V.C. piping has been laid down for observation and tests in Canada. Rigid P.V.C. piping is made in sizes from ½ to 6 inches and in lengths up to 18 ft. It has a continuous loading strength of 2700 p.s.i. and a U.T.S. of 8000 p.s.i. P.V.C. piping must be mechanically supported. The piping has a high resistance to corrosion, giving long life, outweighing its rather high initial cost. It is a poor conductor of heat. Rigid P.V.C. piping can be flanged or screwed. Bends can be produced on site, using blow-torches. P.V.C. piping can be reinforced in order to increase mechanical strength, or it can be used as a pipe lining. D. J. S.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

548. The Esso refinery, Hamburg. F. Schmeling. *Erdöl u. Kohle*, 1954, **7** (9), 565.—A description is given of the latest extensions of the newly amalgamated companies Ebano Raffinerie AG. and the Esso AG. at Hamburg, now known as Esso AG.–Raffinerie Hamburg. These extensions consist of a cat cracking plant with its accompanying crude oil dist unit, having a capacity of 1·2 million tons p.a. By this means the refinery is better able to cope with the market demands for oil products. W. W. G.

549. Production and refining of shale oil. G. H. Smith and D. Stewart. *Fluid Handl.*, Dec. 1954, **5** (59), 332.—A review is given of several commercial methods of refining shale oil, and analyses are given, with physical properties, of the products obtained. 2 schemes for refining shale oil are given diagrammatically, and the results of investigations into hydrogenation methods are reviewed. D. J. S.

550. Mercaptan removal adds two octanes. D. H. Mortlock. *Petrol. Refin.*, 1954, **33** (11), 205–7.—A caustic wash plant has been erected by Aramco at Ras Tanura for decreasing the mercaptan concn of light straight-run naphtha. The plant uses electrolytic caustic regeneration and, with a design capacity of 25,000 b.d. of naphtha, is the largest of its type in use at present. Results of test operation are compared with design data, the differences are discussed, and remedies suggested. The gain in naphtha octane level has been 2 octane numbers instead of 1·8 as expected, although the actual mercaptan removal has not yet reached the design level of 75%. More efficient use of the oxygen liberated in the electrolytic cells and better removal of the disulphides from the regenerated caustic should give a further increase in O.N. R. D. S.

551. Enlarging a gasoline plant. A. L. Johnson. *Petrol. Refin.*, 1954, **33** (11), 192–4.—The capacity of Shell Oil Co's natural gasoline plant at Ventura, California, has been increased by 50% with no increased use of water or steam generating facilities. This was made possible by the use of air-cooled condensers and direct-fired heaters in the extended unit. Design capacity is now 133,000 m.c.f/day. All new facilities were installed and placed in operation without a single plant shut-down. R. D. S.

552. Pressure vessel design. Anon. *Petrol. Refin.*, 1954, **33** (11), 137–55.—A symposium of 3 papers. The first discusses the development of special steels, the technique of construction, and the testing of multi-layer vessels for high-pressure working. The second compares American and European methods for calculating allowable membrane stresses in carbon steel boilers and pressure vessels, and proposes new curves combining European practice at lower temp with Anglo-American practice at higher temp. The remaining paper discusses some of the problems encountered in high- and low-pressure vessel design, including hydrogen attack and graphitization. R. D. S.

553. New plate-to-plate method. W. W. Akers and D. E. Wade. *Petrol. Refin.*, 1954, **33** (11), 199–203.—The method proposed here permits plate-to-plate computations for a multicomponent system in a direct manner by combining the equilibrium and material balance relations on each plate. A calculated introduction of components near the feed plate minimizes many of the problems of feed plate meshing. Trial and error calculations for each plate are eliminated, and plate temp can be determined easily. The time required is claimed to be about the same as for less accurate short-cut methods. A worked example of the method is given. R. D. S.

554. Unilateral thickness gauges. Anon. *Petrol. Times*, 7.1.55, **59** (1498), 24.—Ultrasonic devices are described for measuring sheet or plate thicknesses where only one side is available. Ultrasonic devices can be made to operate on many materials, including steel, non-ferrous metal, plastic, and glass, but the surfaces must be clean and smooth. Magnetic gauges will be described in a later article. G. A. C.

555. Theoretical investigation of the pressure, temperature, and vaporization characteristics of a tube still. J. McLaren. *Petroleum, Lond.*, 1954, **17** (12), 439–9.—The prediction of pressure drop, degree of vaporization, the temp distribution, and the superheat, if any, which may develop in a tube still when a liq is vaporized in it is necessary in design of equipment. These can be determined for any liq by the graphical soln of a combination of Bernoulli's and Fanning's equations. An illustrative example is worked. J. B. S.

556. Condensing vapours on finned tubes. D. L. Katz, E. H. Young, and G. Balekjian. *Petrol. Refin.*, 1954, **33** (11), 175–8.—Correlations are presented for the design of shell and tube condensers using finned tubes. The condensation of propane is considered as an example, and the overall coeff/ft of tube length for finned tubes is found to be almost twice that for plain tubes, making the finned tube unit 20% cheaper. R. D. S.

557. Sea water as an industrial coolant. Pt II. Equipment experience. W. B. Brooks. *Petrol. Refin.*, 1954, **33** (11), 179–82.—Examples are given of the corrosion and protection of condensers, valves, pumps, etc., when using sea water as a coolant. R. D. S.

558. Significance of sectional heat balances and burner performance in furnaces. N. P. Bacon and R. J. Sarjant. *J. Inst. Fuel*, Dec. 1954, **27** (167), 582.—Pt 1 is concerned with the use and interpretation of sectional heat balances, and in Pt 2 the influence of variables of burner design and operation on the temp distribution along the furnace is studied. The discussion is included. D. K.

559. An enclosed-flame radiant burner for gaseous fuels. R. H. Gough. *J. Inst. Fuel*, Dec. 1954, **27** (167), 603.—In the burner described the combustion zone and products stream is confined in the form of a thin disk by 2 plane surfaces, flow takes place radially outwards from the centre. The heat transfer rate to the upper surface is increased by maintaining a high average velocity of the products and by use of a ceramic radiating surface at the lower face. Heat transfer properties of the system are described. The burner is considered suitable for operation by air blast injection in certain industrial applications. D. K.

DISTILLATION

560. Automatic control of distillation processes. II. Instrumentation problems; typical applications. A. Pollard. *Chem. Proc. Eng.*, 1955, **36**, 10–16.—First article (*ibid.*, 1954, **35**, 339–42) dealt with basic general problems of plant control, with reference to continuous fract columns. Second article sub-divides overall problem, and more detailed consideration is given to regulation of individual process streams of typical fract column, whereby essential process variables of column can be controlled. Examples of 4 completely instrumented systems discussed. (Author's summary.)

561. Tag flash vs ASTM distillation. M. van Winkle. *Petrol. Refin.*, 1954, **33** (11), 171–3.—A correlation is presented to predict tag closed cup flash temp from ASTM dist data. The curve is empirical, and is based on only a limited amount of data. Agreement with experiment for a range of hydrocarbons and petroleum oils is better than that given by previous methods, the average deviation being 2° F. R. D. S.

ABSORPTION AND ADSORPTION

562. Electric mercaptan and amine salt–H_2S process. O. J. Sandona and C. W. Rippie. *Petrol. Engr*, 1954, **26** (12), C43–6.—Caustic soda soln, used to extract mercaptans in absorption columns, is a difficult waste product to dispose of, and it can be recovered economically by this process. Atomic hydrogen is passed through the spent caustic, where it catalyses and reacts in the oxidn of mercaptans to disulphides. The disulphides are separated by gravity and, after a naphtha wash, the caustic soln is recycled. Sulphur and polysulphide are removed from caustic soln in a similar manner. J. B. S.

SOLVENT EXTRACTION AND DEWAXING

563. Use of sulphur dioxide for extracting benzene and toluene. R. A. Ratliff and W. B. Strobel. *Petrol. Engr*, 1954, **26** (12), C26–34.—In this process, high recoveries of benzene and toluene–xylene fractions, which have been extracted simultaneously, are obtained, and only one stage of separation is needed to remove sulphur dioxide from the raffinate. Sulphur dioxide solvent extraction, modified for utilization of a hydrocarbon wash oil, is used to effect high purities. The non-aromatics are separated from the benzene by azeotropic dist using methanol as the entrainer. J. B. S.

CRACKING

564. Modern cracking processes in the oil industry. E. Willig. *Erdöl u. Kohle*, 1954, **7** (9), 561.—The theory of cracking, both thermal and cat, is discussed, as is also their effect on the oil industry. Other cat processes dealt with include polymerization, alkylation, isomerization, desulphurization, hydrogenation, reforming, aromatization, and dehydrogenation of aliphatics. A description is given of the main cat cracking and reforming processes in use and also a list of these plants in W. Germany, where the total cracking capacity in 1954 amounted to 3,810,000 tons p.a. W. W. G.

565. Capacity, cat cracking increase as France modernizes refineries. J. Andrault. *Oil Gas J.*, 27.12.54, **53** (34), 226.—France is now self-sufficient in all petroleum products except aviation gasoline; crude oil is from Middle East, with more French crude to come from the Parentis field. Tables show development of distilling capacity, cracking and reforming capacity, and list of French refineries. G. A. C.

HYDROGENATION

566. Hydrofining of middle distillates. R. C. Morbeck. *Oil Gas J.*, 3.1.55, **53** (35), 94.—Hydrofining consists of mild cat hydrogenation at relatively low-pressure conditions, and the process does not require regeneration. The process is very attractive when by-product hydrogen is available from cat-naphtha-reforming operations. Hydrofining improves quality of virgin and cracked middle dist fuels with regard to colour and colour stability, desulphurization, odour, burning characteristics, stability, and blending characteristics. Tables show properties of hydrofined kerosine diesel fuels, virgin and cracked heating oils, and heating oil blends containing hydrofined constituents. The process was developed by Standard Oil Development Co. G. A. C.

CHEMICAL AND PHYSICAL REFINING

567. Filtration of rolling and drawing oils by the Seitz process. H. Wilke. *Erdöl u. Kohle*, 1954, **7** (9), 576.—A process for cleaning used rolling and drawing oils is described. The Seitz process can be operated either by the batch method or continuously. In the batch operation a 2-stage method is used with conventional filter plates and kieselguhr or fuller's earth. In the continuous method the filtration operation is linked up in parallel with the oil circulation of the roller bearings. The filter in this case is of the drum type, with horizontal plates containing thick layers of kieselguhr, which remove solids in suspension, such as very fine metallic powder. Data are given on the performance and costs of the filtration process. W. W. G.

SPECIAL PROCESSES

568. Dehydrogenation by the Houdry process. G. F. Hormaday. *Petrol. Engr*, 1954, **26** (12), C7–10.—Saturated light hydrocarbons are dehydrogenated to mono- and di-olefins by the passage of the vapours, under controlled conditions of space velocity, temp, and pressure, over cat of the chromic oxide–alumina type. High conversion per pass and high product concn are obtained. Process has been used for the dehydrogenation of normal butane to butadiene in a single step. J. B. S.

569. Manufacture and distribution of ethylene. P. W. Cornell, W. H. Litchfield, and H. M. Vaughan. *Petrol. Engr*, 1954, **26** (12), C34–41.—The feedstock is usually propane or refinery gases. This is cracked to form ethylene, which is then purified. This is carried out by: scrubbing with amines and caustic to remove hydrogen sulphide and carbonyl sulphide, passing through solid desiccant to remove water, and hydrogenation or solvent extraction to remove acetylene. Separation is then achieved by reboiled absorption to remove methane, etc., or by low temp fractionation, and the ethylene is recovered from the ethane–ethylene mixture by normal fractionation. J. B. S.

570. *iso*Butylene separation with sulphuric acid. G. P. Banmann and M. R. Smith. *Petrol. Engr*, 1954, **26** (12), C22–5.—This method, developed because of the need for synthetic rubber, is cheaper and gives a higher yield than previous methods. The feed of butane–butylene is extracted in 2 stages by countercurrent contact with sulphuric acid. Raffinate is withdrawn from the second stage. Extract is fed to the regeneration system and, after dilution and heating, *iso*butylene is regenerated as a gas. After caustic scrubbing it is cooled to condense alcohol and polymer, and after a water wash it is compressed and condensed. J. B. S.

571. Production of hydrogen by the catalytic conversion of natural gas with steam. R. D. Obolentsev *et al.* *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk*, 1954, (8), 133–46.—Lab investigation of kinetics of reaction of nat gas (95–96% CH_4, 1% C_3+, 3% N_2) with steam at atm pressure. Ni cat of commercial type. Gas is freed from CO_2, O_2, H_2O, then satd with H_2O at known temp. Detailed results are given for series of tests at space velocity 400–17,000 vol/vol cat/hr, mol ratio steam/CH_4 2–3/1, temp 550°–800° C. In cat life test (240 hr, no diminution of activity noted) at space velocity 1000 vol/vol cat/hr, steam/CH_4 2/1, 800° C, output gas comp CO_2 5·4%, CO 17·4, H_2 76·1, CH_4 0·4, N_2 0·7; some H_2S formed by reaction of H_2 with cat in initial stages, but disappears later. No C deposition on cat is observed when converting CH_4, but some occurred if higher (C_3+) hydrocarbons were added (*ca* 5%) to gas. CH_4 conversion process is considered applicable to plant scale, with object of utilizing in hydrogenation refining H_2 thus produced. V. B.

572. Test of some oxide catalysts in the synthesis of hydrocarbons from carbon monoxide and hydrogen. A. N. Bashkirov and S. M. Loktev. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk*, 1954, (8), 147–53.—Using 1/1 CO/H_2, space velocity 100–200 hr^{-1}, 250 atm, 400°–450° C, and ThO_2 and ThO_2/Al_2O_3 cat total hydrocarbon yields of up to 105 g/m³ (liq up to 57 g/m³) were obtained. Cat activity was maintained after 10 days, despite visible traces of C deposition. High (18–75%) proportion unsaturateds, increasing with mol. wt., and low aromatics (most in heavier fractions). Cat based on Al_2O_3 and Cr_2O_3, and mixtures thereof, have considerably lesser activity. Highly active ZnO/Al_2O_3 cat gave product with high proportion (up to 87% alc) of O-containing compounds. V. B.

METERING AND CONTROL

573. Instrumentation and automatic control in oil refineries. I. Control requirements. E. H. W. Banner. *Petroleum, Lond.*, 1955, **18** (1), 6–9.—The effect of a deviation from the controlled condition is discussed, the action of proportional, integral, and derivative action in 1-, 2-, and 3-term controllers being considered. The effect of proportional band width is also discussed. Location of measuring and indicating or recording elements are also considered with respect to refinery operation. J. B. S.

574. All-electric control of crude-distillation units. P. W. Mason. *Oil Gas J.*, 3.1.55, **53** (35), 108.—The first twin all-electrically controlled 60,000-brl/stream day crude-dist unit at the British Petroleum Co's Aden refinery is now on stream, controlled from a central control room with a panel designed for max utility and very fast maintenance work. Layouts of alarm systems are given. G. A. C.

575. Electronic control all the way. Anon. *Petrol. Refin.*, 1954, **33** (11), 156.—At Indianapolis, Rock Island Refining Corpn recently started up a 2400-b.d. platforming unit controlled entirely by electronic instruments. These instruments use greater derivative action and have greater sensitivity in control than normal temp controllers, making it possible to

correct very small temp changes before they become noticeable on the recorder. R. D. S.

576. Photo-electric instruments in the refining of mineral oils and coal. W. Langhein. *Erdöl u. Kohle*, 1954, **7** (9), 573.—The use of photo-electric methods is described with special application to the oil refining and coal industries. Among the applications mentioned are alarms for the outbreak of fire or the filling of a tank to a prescribed level. In general, these methods can be applied to the following: (1) as a substitute for human supervision in (*a*) mechanical processes containing recurring visual indications, (*b*) processes in which observations cannot be taken by ordinary means owing to the high velocity of the reaction, (*c*) visual comparisons of very small changes in turbidity, colour, brightness, and gloss, (*d*) observations in processes at recurring intervals of time both regular and irregular; (2) continuous control, measurement, counting, and regulating of visual points in processes so as to ensure the correct operation of the process; (3) aid against risk of visible dangers. W. W. G.

577. Instrumentation conferences in the U.S.A. Anon. *Petrol. Times*, 24.12.54, **58** (1479), 1325.—Papers recently presented in the U.S.A. on analysis instrumentation of interest to the oil industry are reviewed. These include: "Application of Magnetic Recording to Leisure Exploration," "Supervisory Instruments for Steam Turbines," "Instrumentation of a Steam Power Plant," "A Catalytic Combustion Hydrogen Gas Analyser," "Segmental Recorders," "Instrumentation for Precise Fractionation of Benzene and Toluene," and "Differential Measurement and Control of Corrosive Streams." G. A. C.

PRODUCTS

CHEMISTRY AND PHYSICS

578. Applied chemical kinetics. X. Liquid phase reactions. J. C. Jungers and F. Coussemant. *Rev. Inst. franç. Pétrole*, 1954, **9**, 619–97 (*cf* Abs. **1793**, 1954).—Further instalment, dealing with elementary reactions, and physical and chemical part played by the solvent. V. B.

579. Limited coalescence of oil droplets in coarse oil-in-water emulsions. R. M. Wiley. *J. Colloid Sci.*, 1954, **9**, 437–37.—Coalescence of emulsion droplets, at a rate which decreases to zero as the droplets approach a limiting size and relatively uniform size distribution, a little-known but widely-occurring phenomenon termed "limiting coalescence," is investigated.

An explanation of the phenomenon on the basis of the Gibbs–Kelvin relation between the radius of droplet curvature and the adsorption of the emulsifier particles is proposed. A relation between the limiting size of emulsion droplets, the amount and particle size of emulsifier, and the volume of the emulsified phase is derived on the assumption of monolayer adsorption of emulsifier particles. Experiments confirming this relation are described. (Author's abstract.)

580. Influence of high polymer on the rheological properties of a carbon black suspension. J. Riseman and R. C. Harper, Jr. *J. Colloid Sci.*, 1954, **9**, 438–50.—Carbon black suspensions (1·5 and 3·0% concn) in petroleum oil, to which were added various concn of one of 2 polybutene polymers of mol. wt. 45,000 and 100,000 were examined in a coaxial cyl viscometer. All the soln gave flow curves typical of simple plastic or Bingham flow, although for reproducible results the soln had to be kept at 30° C for at least 30 hr before evaluation. The plastic visc values are independent of the rate of shear over the range studied.

It was found that: (1) the plastic visc compared with the visc of the polymer–oil as "dispersing medium" remains substantially constant, independent of polymer concn or mol. wt., over the range studied; (2) the yield stress is markedly dependent on the concn and mol. wt. of the polymer, and cannot be due to changes in the medium visc—it is suggested that a structure reinforcement occurs because of the binding of carbon particles by adsorbed polymer mol; (3) the available surface area of the carbon particles may well depend on the method of making the suspension, and the extent of adsorption of polymer will therefore depend on this factor. H. C. E.

581. Resistance to flow of liquids over solids by thin films extending from the edge of pools or from menisci. E. B. Bielak, G. E. N. Calderwood, and W. E. J. Mardles. *Nature, Lond.*, 1954, **174**, 1009.—Resistance to the rate of spreading, capillary flow, etc., of liq (including lubricants) cannot be attributed to effect of contact angle, which, for surfaces wet with the respective liq, is small or zero. For example, the plot of rate of radial spread over a horizontal surface of liquid *vs* ht or $(ht)^3$ of the liq pool is curvilinear; similarly, the plot of rate of movement of a liq index in a capillary *vs* force acting is curvilinear.

In a dry tube, ahead of the advancing meniscus of, *e.g.* *n*-heptane, interference colours due to the presence of a heptane film can be seen; with water microscopic droplets can be observed. The meniscus is therefore in effect greatly extended. In recession the meniscus, attached to the wet film on the wall, is again extended, and the recessional flow is non-Newtonian and rhythmic.

The effect of resistance offered to recessional flow is seen in the spread of a liq pool between approaching or separating flats. When the film is *ca* 10 μ in thickness, movement is interrupted due to the instability and rupture of the film, and there is a resistance to further spreading, which is filiform in character.

The spreading of binary mixtures and of pure liq on different surfaces is discussed (*cf* Abs. **89**, 1955). H. C. E.

582. Effect of gas and solid mixing in fluidized beds on chemical reactions. G. H. Reman. *Chem. & Ind.* 1955, 46–51.—Quant measurements of gas and solid mixing are described, and influence of mixing on reaction rate and conversion in general, and in specific case of fluidized bed reactor, are discussed. Concluded that mixing in fluidized bed reactors may have pronounced effect on course of chemical reactions. Lower conversion and space velocity are found than for fixed bed reactors, but drawbacks can probably be largely overcome by proper reactor design. B. S. W.

583. More data on 2-phase vertical flow. W. C. Galegar, W. B. Stovall, and R. L. Huntington. *Petrol. Refin.*, 1954, **33** (11), 208–11.—A report of a study of the vertical flow of gas–liq mixtures in a 72-ft length of 2-inch tubing. The change of flow pattern with gas flow rate is described, and the pressure drop for varying liq and gas rates plotted. For high liq rates, an increase in gas rate causes a decrease in pressure drop until a gas mass velocity of 150 lb/sq. ft/minute is reached, after which the pressure drop remains substantially constant. R. D. S.

ANALYSIS AND TESTING

584. New apparatus for determining ageing resistance of lubricating oils. B. Blouri. *Chim. et Industr.*, 1954, **72**, 1169–74.—Illustrated description of test equipment developed by Gaz de France for gas meter lub oils. Glass 200 ml tube, 100 g oil, in oil bath at 164° C, 36 litres/hr air introduced through stirrer, cat 60 cm^3 Cu, 8 hr. Good gas meter oil should have visc increase approx 20%, asphaltenes <0·36%; for motor oils test temp is 208° C, visc increase <25%, asphaltenes <0·25%. V. B.

585. Rapid method of estimating unsaturated gaseous hydrocarbons by anodic halogenation. K. Bratzler and H. Kleemann. *Erdöl u. Kohle*, 1954, **7** (9), 559.—The apparatus described and illustrated is adapted for the rapid determination of olefins and also for the control of individual olefin content in the gas stream. The method consists of passing the gas over

an anode in an electrolyte composed of a dilute soln of sulphuric acid and potassium bromide so that a slight excess of bromine is present which can be indicated by passing through a potassium iodide–starch soln. Fresh electrolyte and indicator soln are continuously supplied to the vessels, and the amount of bromine generated at the anode is controlled by the current strength used, which can be read on a suitable instrument. It is necessary to keep the temp of the gas and electrolyte constant.

For automatic control, the change in light intensity due to the colour of the potassium iodide–starch soln can influence a photoelectric cell, which controls a small motor connected with the electrolytic cell and which supplies the current to the anode, thereby controlling the amount of bromine generated. W. W. G.

586. Assessment of the efficiency of distillation columns having a fixed packing. H. Brusset and E. Chahvekilian. *Chim. anal.*, 1954, **36**, 315–26.—Concept of HETP is discussed, with influence thereon of various factors (transfer coeff, vapour velocity, relative volatility, pressure, hold-up). Desirable characteristics of binary test mixtures for determination of HETP are considered and a list of such mixtures (11 for use at atm pressure, 9 for reduced pressure), taken from literature, are given, with explanatory notes concerning each. 31 refs. V. B.

587. Fire alarm for bitumen, tar, and roofing paper works. F. J. Heinrich. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (10), 341.—A new illustrated ionization fire alarm comprises an open and a closed chamber. The contained air—ionized by radium preparations—conducts electricity. Access of burnt gases to the open chamber lowers the conductivity and increases the resistance in the circuit, resulting in acoustic and optical alarm signals. R. T.

588. New data on fluid coking. F. B. Johnson and R. E. Wood. *Petrol. Refin.*, 1954, **33** (11), 157–60.—Pilot plant tests, giving coking information on 10 residuum stocks which cover a wide range of feed stock quality, have been made in 100 b.d. and 0·1 b.d. fluid coking units. The results are reported here, and a comparison with commercial plant delayed coking of atmospheric residuum is included. The fluid process was easily adapted to operation on all the stocks tested, and the ultimate coke yield was found to be directly proportional to the feed stock Conradson carbon. R. D. S.

589. Examine fuel oils with microscope. Pt I. A. O. Walker and J. P. Stanton. *Petrol. Refin.*, 1954, **33** (11), 187–91.—A microscopic method has been developed to study the storage stability and filterability of diesel and fuel oils. It may also be used for evaluating stabilizers. The method used is a sludge particle size classification and count procedure, carried out under a microscope fitted with a graticule, at 200× magnification. Differences in sludge content are measurable after only a few weeks storage at normal temp. R. D. S.

590. Photography in oil research. Pt II. A. J. Insall and J. W. Drinkwater. *Petroleum, Lond.*, 1954, **17** (11), 391–4.—Analysis of engine deposits arising from the use of fuel additives is carried out by means of X-ray diffraction patterns. Milligrams of sample can be analysed, but substances present to the extent of less than 10% are liable to escape detection. Wear of metal cutting tools is measured by using an irradiated tool and obtaining auto-radiograph of product to show amount of tool transferred. This can be measured quantitatively by comparative methods. The structure of greases is examined by means of the electron microscope, and electron diffraction patterns characteristic of the surface layers are obtained. J. B. S.

GAS OIL AND FUEL OIL

591. Catalytic oil gas plant. Anon. *Engineer, Lond.*, 1954, **198**, 786.—New "Segas" (SE. Gas Board) plant to produce 3,200,000 cu. ft. gas/day from oil is to be installed at Ponders End works. Improved vap chamber increases efficiency of heavy fuel oil vap in steam before it reaches cat bed. Waste heat boiler provides steam requirement. Gas produced has similar cal. val., sp. gr., and combustion characteristics to those of town's gas. A. C.

LUBRICANTS

592. Diesel engine wear reduced. Anon. *Auto. Engr*, 1954, **44** (11), 482.—The effects of a proprietary diesel fuel additive are described, and the results of tests on a fleet of public service vehicles are given. T. T.

593. Explosion characteristics of a lubricating oil mist. J. H. Burgoyne, D. M. Newitt, and A. Thomas. *Engineer, Lond.*, 1954, **198**, 165–8.—In event of serious overheating of lubricated part in a crankcase, formation of condensed mist ("smoke") is accelerated, and may be accompanied by decomposition of lub oil to form inflammable vap. Overheated part constitutes potential source of ignition, and majority of crankcase explosions are thought to originate in this way. Study of properties of lub oil mist gave following results: (1) lower limit of inflammability in air is *ca* 3·9% wt; (2) upper limit of inflammability is not defined, but flames could be propagated through mists of very high density; (3) mist completely non-inflammable in air containing 28·3% vol of CO_2; (4) max burning vel 0·044 gm/sq. cm/sec at normal temp, increased by *ca* 30% at 100° C; (5) particle size of oil droplets in mist mainly around 10 μ; (6) burning properties of mist not affected by variations in droplet size caused by ordinary changes in conditions of mist formation. A. C.

594. Identification of Pennsylvania lubricating oils by refractivity intercept. R. Putscher and M. Fred. *Petrol. Engr*, 1954, **26** (12), C13–16.—The oils are first separated by silica gel adsorption into paraffin–naphthene and aromatics fractions; the aromatics fraction is discarded. The physical properties of the paraffin–naphthene fraction are determined and density plotted against refractivity intercept. At 25° C any oil within the limits density 0·8400–0·8480 and refractivity intercept from 1·0442 to 1·0449 originates from Pennsylvania grade crude oil fields. J. B. S.

595. Planned lubrication at the Steel Company of Wales. 2, 3. H. Harber. *Sci. Lubric.*, 1954, **6** (9), 12, 14.—Testing procedure, equipment in the lubrication laboratory, and the routine checks carried out are briefly described. The special lubrication installations in the 3 blast furnaces are described, the special problems encountered in blast furnace lubrication indicated, and methods for protection of the lubricating equipment from the effects of coke dust outlined. J. G. H.

596. Marine lubrication. G. H. Clark. *Trans. Inst. Mar. Engrs*, 1954, **64** (10), 229.—The author briefly covers the refining of lub oils, lab tests and their significance, the use of additives, the fundamental principles of lubrication, and lubrication problems associated with reciprocating steam engines, geared steam turbines, and diesel engines. 21 refs. T. T.

BITUMEN, ASPHALT, AND TAR

597. Bitumen—its application in roadmaking and in industry. W. Becker. *Erdöl u. Kohle*, 1954, **7** (9), 597.—The production of asphaltic bitumen from crude oil is described, and the different grades are listed as required for the construction of asphalt roads and for various industrial outlets, such as building, pipes, electric cables, rubber, paper, linoleum, etc. Statistics are supplied for the annual consumption of asphaltic bitumen in roadmaking, in building, and for industrial outlets in Germany for the years 1932–38 and 1948–53. W. W. G.

598. Bituminous sealing materials for stoneware waste pipes and their testing. H. E. Müller. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (8), 299–300.—Bitumen or tar mixed with

chamotte dust, finest quartz dust, or limestone dust has replaced clay and cement for joining earthenware waste pipes. For testing bitumen-base sealings DIN 1996—formulated essentially for poured road paving—is standard, for tar the testing principles for tight sealings on ceramic waste pipes are standard. The latter—not included in DIN 1996—are given for shrinkage, resistance to cold, and adhesion, with explanatory drawings. R. T.

599. Bituminous materials, their processing and use mirrored in newer German patent literature (Complement). H. Hoffmann. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (10), 325–7; **5** (11), 366; **5** (12), 397.—Continued classification with full descriptions. R. T.

600. Comparison of ASTM specifications for bitumen roofing paper with corresponding DIN 52128. K. Dahmer. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (9), 286.—Criticism of Dr Ziegler's article, *ibid.*, 1954, **5** (6). R. T.

601. Roofing paper testing. A. W. Rick. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (10), 332–4.—Pt 10, the concluding article, discusses bleeding of tar and bitumen masses, and relevant tests for this phenomenon and other properties are described. R. T.

602. Mixtures of coal tar pitch and petroleum bitumen. Microscopic appearance. R. Thevenin. *Rev. Inst. franç. Pétrole*, 1954, **9**, 614–18.—Mixtures (5–95%) of 6 hard (pen <20, m.p. (K.S.) 60°–80° C) petroleum bitumens (S.R., cracked, from de-asphalting, do. after blowing, do. after cracking) with 3 coal tar pitches, prepared in liq state; examination of film 0·03 mm thick, 18 photo-micrographs are reproduced and findings discussed. Max heterogeneity with S.R. bitumen, homogeneous mixtures obtained with cracked de-asphalting bitumen. V. B.

603. Tar products and their use. H. Nedelmann. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (9), 278–9.—In 1953 crude tar production in the Federal German Republic was *ca* 1·6 million tons. Products are given in tons. Applications of pitch and oil are given in % and discussed. R. T.

604. Tar distillation. W. Metzendorf. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (9), 280–6.—Production in the Federal German Republic in 1953 was 1,410,000 tons coke oven tar and 205,000 tons gas tar, respective figures for 1939 were 1,747,000 tons coke oven tar and 255,000 tons gas tar. In 1945 road tar production was 25,000 tons, in 1953 320,000 tons. Details of processing and dist with recovery of pure products—listed as hydrocarbons, O_2 and N_2 compounds are given. R. T.

605. Contribution to colloidochemical analysis of coal tars. H. Mallison. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (9), 287–90.—In preparative separation oil dist at 250° C, of large quantities, precedes separation of the residue into 4 resin fractions with selective solvents. In analytical procedure 1 g is taken; medium and viscous tar oils are isolated with selective solvents; the other 3 fractions are obtained by difference. Procedure and importance of standard solvents are discussed. For this procedure, which gives a deeper insight into the colloidal systems tar and pitch, international uniformity of application and nomenclature are essential. R. T.

COAL, SHALE, AND PEAT

606. The influence of surface-active agents on the charge density of coal. I. Meltzer. *Riv. Combust.*, 1954, **8** (11), 804–18.—The influence of surface-active agents on the charge density of coal of different sizes has been investigated. The addition of wetting agents to wash water of coals has a beneficial effect on charge density and displaces the minimum value of charge density towards the lower moisture contents. These effects are more pronounced the higher the content of smaller size components in the mixture. It may be concluded that the use of wetting agents in the practice of coal carbonization could possibly allow the keeping of moisture between narrower limits. Wetting agents will also effect a more regular distribution of moisture in the bulk coal prepared for the carbonization. (Author's summary.)

607. Chemical, thermodynamic, and kinetic basis of the cracking of tar hydrocarbons in coke- and iron-ore-furnaces. E. B. Brachetti. *Erdöl u. Kohle*, 1954, **7** (9), 555.—The hot gases from coke- and iron-ore-furnaces are passed through filters to remove dust and tars at the stage when most of the tar hydrocarbons have been decomposed by cracking. The theoretical basis of the cracking of hydrocarbons is discussed and illustrated by curves showing the variation with temp, in the case of different types of hydrocarbons, of the free energy and the equilibrium constants of formation. Curves are also given of the variation with temp of the free energy of transformation of the various oxides of iron in the presence of different types of hydrocarbons and of carbon, carbon monoxide, and hydrogen.

A description is given of the apparatus employed for this investigation, in which nitrogen was used as the carrier gas which contained a tar aerosol of known tar content at temp between 700° and 900° C, using various filtering media such as coke, coke + 1% activated acid clay, coke + 1% activated neutral clay, red iron ore, and brown iron ore. In these experiments conversion of up to 95% was obtained. W. W. G.

608. Chemical composition of gasoline obtained by thermal solution of Estonian oil shales. M. K. D'yakova and N. A. Davtyan. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk*, 1954, (9), 124–44.—Gasoline (E.P. 200° C) from thermal soln (*cf* Abs. **521**, 1945) at 430° C, ½ hr in autoclave, of shale with 60·6% org content, using 200°–325° C shale oil cut as solvent. Detailed analysis of narrow cuts; $KMnO_4$ oxidn of unsat and identification of resultant fatty acids; chromatographic separation of aromatics followed by chem and spectral identification; cat dehydrogenation for detection of 6-membered naphthenes; fractionation and Raman spectra for identification of paraffins and 5-membered naphthenes. List of 37 identified hydrocarbons is given; from such detailed analysis composition is calculated (%) as: unsaturated (including 8 compounds) 15, aromatics 17, 6-membered naphthenes 9, 5-membered naphthenes 15, *n*-paraffins 36, *iso*paraffins 8. V. B.

MISCELLANEOUS PRODUCTS

609. The rubber industry and petroleum. Anon. *Petrol. Times*, 7.1.55, **59** (1498), 21.—The work of the Research Association of British Rubber Manufacturers in the new laboratories at Shawbury, nr Shrewsbury, is described. Studies of synthetic rubbers, carbon black, and softeners are made, and rubber products that have failed in service are investigated. The ageing of rubber and means of preventing it are also subjects of research. G. A. C.

610. Surface coating applications of epoxide resins. R. W. Wheeler. *Paint Tech.*, Dec. 1954, **18** (207), 131.—Aspects considered are: nature and properties of epoxide resins; methods of use in coatings, esterification, cross-linking with phenolic resins, cross-linking with amino resins, cross-linking with amines; modification of alkyds; and epoxide resin–*iso*cyanate compositions. D. K.

CORROSION

611. Corrosion in the petroleum industry. Pt II. F. H. Garner and A. R. Hale. *Petroleum, Lond.*, 1954, **17** (12), 440–2.—Corrosion in condensing equipment is most severe where water is present in the liq form. C.I. condenser shells are liable to graphitization, and Admiralty brass, Al brass, and 70–30 cupro-nickel all show corrosion. Overhead corrosion is minimized by control of pH and the use of inhibited brass or 70–30 cupro-nickel for tubes and Monel for plates. Plant handling sulphuric acid can use plain carbon steel for acid above 75%. Below this lead is used. Various materials for valves and pumps handling acid sludge are also discussed. J. B. S.

612. Corrosion conference at Frankfurt. Anon. *Petrol. Times*, 7.1.55, **59** (1498), 22.—A review is given of papers presented at the corrosion conference held under the auspices of Deutsche Gesellschaft für Chemisches Apparatewesen, Nov. 1954. Oxidn and corrosion at medium and low temp, solid corrosion products as a corrosive factor, temp and boiler corrosion, corrosion by sulphuric acid, and methods of prevention of corrosion were among subjects dealt with. G. A. C.

ENGINES AND AUTOMOTIVE EQUIPMENT

613. Preventive maintenance from breakdown experience on diesel engines. H. D. Adam. *Gas Oil Pwr*, 1954, **49**, 295–300.—This article contains data on the fuel injection and lub oil systems. Wear of the moving parts of the fuel injection system may result in one cyl becoming overloaded; this condition can be detected by measuring the exhaust temp. It is recommended that a separate exhaust pipe be installed for each cyl; *inter alia*, a visual check on the exhaust smoke shows when conditions in any particular cyl are defective. Leakage in the lub oil system can be detected by excessive pressure drop between the pump and the end of the main pipe. Lub oil should be properly cooled, if possible not with the engine circulating water, but with an independent supply. Particular attention should be paid to the oil circulation past the gudgeon pins and big-end bearings. The remedy of increasing the clearances of bearings which run hot cannot be recommended, as it increases the danger of knock; furthermore, the pump may not be large enough to deal with the increased flow of oil. Before starting the engine after a long stop the cyl should be lubricated. H. C. E.

614. Excessive consumption of lub oil on Doxford engine. A. W. Davies. *Gas Oil Pwr*, 1954, **49**, 294.—On a marine engine heavy blow-by resulted in stuck piston rings. When this fault had been corrected there was a loss of lub oil of 14 gal/cyl/day, which was righted when the scraper box was replaced by another. The grooves of the used scraper box were found to be of conical formation to the extent of 0·002 inch over the radial width of the landing, and this was thought to cause formation of an oil wedge against the working face of the scraper ring. It was concluded that the conical formation was caused by overheating of the cast-iron scraper box when blow-by had occurred, thus leading to permanent deformation. H. C. E.

615. Hydrogen engine. R. O. King and M. Rand. *Nature, Lond.*, 1954, **174**, 975.—With a C.F.R. engine premature ignition of hydrogen–air mixtures occurs solely either: (1) when the exhaust valve or the ceramic core of the plug attains a temp which causes the mixture to ignite; or (2) by nuclear ignition due to finely divided C produced by decomp of lub oil. By reducing the temp of the spark plug core and the exhaust valve, and avoiding the passage of an excessive amount of lub oil into the combustion chamber, it has been possible to run the engine at speeds up to 1800 r.p.m. with C.R. as high as 12 : 1. A max of 47½% has been attained for indicated thermal efficiency and a m.e.p. of 146 p.s.i. at 1500 r.p.m; these values exceed recorded figures by a wide margin. The results show that self-ignition does not arise from a chain reaction occurring in the combustion chamber. H. C. E.

616. Testing David Brown engines. Anon. *Gas Oil Pwr*, 1954, **49**, 272–4.—Describes the test house and running-in plant comprising 17 dynamometer test beds and 12 running-in beds. Water is used in the dynamometers, and is supplied by a pump of capacity 15,250 gal/hr, and hot water flows to a well, whence it is passed via coolers to a main storage tank. 5 fuel systems are installed, for gas oil, vaporizing oil, petrol, kerosine, and coal gas, the latter being used for running-in the engines because of its cheapness and small deposits after combustion. Used and unused lub oil tanks each hold 1000 gal. Fresh oil can be metered directly to the engine; used oil is drawn off to underground tanks and centrifuged before re-use. H. C. E.

617. British developments in gas turbines. H. R. Cox, A. T. Bowden, R. J. Welsh, and W. R. Hawthorne. *Gas Oil Pwr*, 1954, **49**, 290.—A survey is given of some of the sets recently constructed in the U.K. Industrial types are available in sizes from 50 h.p. to 20,000 kW, and some units of power in the range 1000–10,000 kW are briefly described. Rail traction employs a 3000-h.p. gas turbine locomotive running on oil, and a coal-fired unit is now being built. Road transport is represented by an experimental Rover gas turbine. H. C. E.

618. Free-piston gas turbine. R. P. Ramsey. *Oil Gas J.*, 3.1.55, **53** (35), 127.—This is a first of a series of articles on various aspects of the free-piston gas turbine, and describes how the engine works. Injection and combustion, scavenging, and compression stages are explained and advantages of engine stated. G. A. C.

619. Annular combustion for turbine engines. M. A. Stokes. *Aeroplane*, 14.1.55, **88** (2269), 48.—This well-illustrated article, by the Head of the Combustion Department of Armstrong Siddeley Motors, discusses some of the features of the various types of combustion chamber, with particular reference to the annular layout. U. M.

620. Gas engine-compressor sets at Coryton refinery. Anon. *Gas Oil Pwr*, 1954, **49**, 252–4.—Fuel for these sets is obtained from the dist units, thermal reformer, and Thermofor cracking unit, and its net calorific value is 2050 B.T.U/cu. ft. Before use as fuel the gases are scrubbed to remove H_2S. There are 4 engine compressor sets, each comprising 6 vertical power cyl of bore and stroke 8½-inch coupled to 3 scavenging cyl of bore 15½ inches and stroke 8½ inches. They run at 400–600 r.p.m. with max output of 225 b.h.p. They are provided with full forced feed lubrication to main- and connecting-rod bearings, power pistons, crosshead pins, and camshaft bearings. The units are started by compressed air, and cooling water is circulated on a closed circuit. The gas from the Thermofor cracking unit is compressed in these sets to 85 p.s.i. from atmospheric in a single stage. Because of the high H_2S content of the gas, flushing oil is injected into the compressor cyl, which are also fitted with micarta rings. H. C. E.

621. Tangye fuel pump with plain plunger. Anon. *Gas Oil Pwr*, 1954, **49**, 265.—For operation on low-grade fuel engines must be started on gas oil, and the fuel must be heated to dissolve the wax; this is usually achieved by heat exchanger with exhaust gases. The change of fuels is made manually when the visc of the low grade fuel is sufficiently reduced. Since the normal helix type of pump is quickly worn by abrasives in low grade fuel, the pump described incorporates a plain plunger with adjustable packing gland to compensate for wear. The construction of the pump and its method of use are briefly described. H. C. E.

ABSTRACTS

	PAGE
OILFIELD EXPLORATION AND EXPLOITATION	
Geology	67 A
Geophysics and Geochemical Prospecting	70 A
Drilling	71 A
Production	71 A
Oilfield Development	72 A
TRANSPORT AND STORAGE	73 A
REFINERY OPERATIONS	
Refineries and Auxiliary Refinery Plant	73 A
Absorption and Adsorption	75 A
Cracking	75 A
Chemical and Physical Refining	75 A
Special Processes	75 A
Metering and Control	76 A
PRODUCTS	
Chemistry and Physics	76 A
Analysis and Testing	76 A
Gas	76 A
Lubricants	76 A
Bitumen, Asphalt, and Tar	76 A
Special Hydrocarbon Products	77 A
Derived Chemical Products	77 A
Miscellaneous Products	77 A
CORROSION	77 A
ENGINES AND AUTOMOTIVE EQUIPMENT	78 A
SAFETY PRECAUTIONS	78 A
MISCELLANEOUS	78 A

AUTHOR INDEX

The numbers refer to Abstract Numbers

Andrichuk, J. M., 647
Barnes, H., 639
Beaumont, F. N., 756
Binger, W. W., 691
Bland, W. F., 755
Bonilla, M. G., 644
Brockwell, P. A., 727
Brook, M., 742
Browne, W. H., 664
Bundrant, C. O., 664
Campbell, D. L., 693
Chartener, W. H., 760
Coenen, C. B., 722
Condon, M. A., 655
Corrigan, T. E., 705–6
De Ardo, A. K., 731
Dehlinger, P., 664
Dewees, E. J., 665
Dickey, P. A., 642
Edwards, J. M., 670
Egloff, G., 751
Eltenton, G. C., 719
Erickson, R. L., 624
Felts, W. M., 637
Fisher, D. W., 646
Fontenot, J. B., 694
Forbath, T. B., 726
Forgotson, J. M., Jr., 632
Fortier, Y. O., 651
Fowler, F. C., 716
Frink, J. W., 645
Fritts, H. W., 691
Galovic, S., 678
Gardiner, W. L., 667
Gardner, F. J., 635, 676
Garlick, J. M., 672
Garner, F. H., 737
Garst, A. W., 663
Goalwin, D. S., 710
Graffney, B. J., 726
Grahl, E. R., 695
Grant, L. F., 636
Groth, V. J., 744
Hafsten, R. J., 744
Halbouty, M. T., 627, 628
Hall, R. T. W., 737
Hamilton, H. L., 682
Harber, H., 729
Hardin, G. C., 627–8
Hatch, L. F., 738
Havenaar, I., 660
Hawkes, A. S., 711
Hawkins, M. F., 666
Hedberg, H. D., 622
Henderson, W. R. S., 649
Henshilwood, C. P., 701
Hine, H. J., 753
Hodgson, G. W., 648
Holter, L. E., 670
Hornaday, G. F., 717
Horr, C. A., 624
Huang, C. J., 720
Hunt, C. W., 650
Hunt, J. M., 642
Hyzer, R. E., 705
Imlay, R. W., 644
James, A. T., 723
Johnson, A. I., 720
Jones, E. K., 739
Jordon, L., 626
Kelley, R. E., 698
Kemp, J. D., 720
Kent, P. E., 656
Kimmel, M. L., 666
Kipp, E. M., 731
Knutson, C. F., 669
Kues, H. A., 645
Langenheim, R. L., Jr., 640
LaQue, F. L., 743
Lasslo, T. S., 712
Leach, R., 684
Lummus, J. L., 661
Mabbs, E. G., 699
Mabey, D. R., 657
McCabe, W. S., 634
McGregor, D. J., 635
Mackintosh, C. F. M., 752, 758
Macleod, D. M., 707
McNair, A. H., 651
Madden, W. E., 754
Miguax, L., 658
Mize, W. W., 681
Moneymaker, B. C., 656
Moody, G. B., 675
Moore, J. W., 703
Moorman, J. W., 709
Morrisey, N. S., 629, 673
Myers, A. T., 624
N.A.C.E. Technical Unit Committee I-G, 745
Nelson, L. B., 748
Oberbach, J., 734
Oden, E. C., 694
Olson, W. S., 652
Osmond, J. C., 643
Packie, J. W., 693
Pakiser, L. C., 657
Paredes, F., 681
Passega, R., 623
Patrik, E. A. K., 701
Paul, M. J., 684
Pearson, G. H., 696
Petrarca, C. A., 713
Pickel, T. W., 698
Pinfold, E. S., 671
Procopi, J., 708
Ramsey, R. P., 749
Rick, A. W., 732
Riggs, C. H., 674
Russell, G. L., 748
Scheurer, A., 733
Schlocker, J., 644
Schmitt, G. T., 630
Seay, J. G., 716
Sherwood, P. W., 735
Sittig, M., 711
Skiba, E. J., 700
Smith, R. V., 665
Steiner, H., 752, 758
Stewart, F., 642
Strasser, D. M., 740
Strickland, J. W., 641
Thalmann, E. H., 747
Thompson, E. T., 760
Thomson, J. E., 684
Tiedje, J. L., 707
Thornton, D. P., 679, 750
Thorsteinsson, R., 651
Treadwell, R. C., 625
Treseder, R. S., 746
Trusler, J. D. C., 668
Urner, R. S., 722
Vorman, E. J., 694
Waetjen, C. H., 735
Ward, J. M., 724
Warrick, R. E., 657
Weber, J. H., 721
Wengerd, S. A., 641
Wieland, R., 746
Williams, R. H., 665
Wilson, G. W., 698
Wilson, J. L., 631
Wonfor, J. S., 647
Zahnstecher, L. W., 713

OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

622. World oil prospects—from a geological viewpoint. H. D. Hedberg. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1714–24.—Both world oil production and the world's known oil reserves appear to increase persistently year after year. The author considers it worth investigating from a geological viewpoint the significance of these trends. He points out that these increases come mainly not from new oil-producing regions but from further development of long-established regions constituting only a small fraction of the world's prospective oil territory. While the chances still favour additional highly productive discoveries in new regions, it has to be admitted that the evidence also seems to indicate that there are many regions of the world which will always remain barren or poorly productive. E. N. T.

623. Turbidity currents and petroleum exploration. R. Passega. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1871–87.—The study of turbidity currents from the point of view of petroleum geology is important. Turbidity currents are formed by the suspension of sediments in water which, denser than surrounding clear water, slide down the submarine slope of sedimentary basins. As long as the slope is sufficient, the current keeps its speed and turbulence holds the sediments in suspension. If speed decreases, part of the load, beginning with the coarsest grains, settles. Turbidity currents are important to sedimentation through the ability of some of them to transport considerable volumes of sand several hundred miles from shore into deep parts of basins. No other known sedimentary agent is capable of this action.

This paper describes the applications of theories of deposition by turbidity currents to solving a number of geological problems, and suggests that familiarity with some of their characteristics can considerably help the exploration geologist. E. N. T.

624. Association of uranium and other metals with crude oil, asphalt, and petroliferous rock. R. L. Erickson, A. T. Myers, and C. A. Horr. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 2200–18.—This paper is an attempt to rationalize the relationship of uranium with associated hydrocarbons. A number of

spectrographic analyses of the ash of crude oils, natural asphalts, and oil extracted from petroliferous rock indicate that metals such as vanadium, nickel, copper, cobalt, molybdenum, lead, chromium, manganese, and arsenic are consistently present in this type of organic matter. The uranium content of the ash of such oils ranges from *ca* 0·01% to *ca* 10%; the uranium content of the total oil or asphalt ranges from less than 0·01 to 32,410 p.p.m. or 3·24%.

The authors point out that the association of uranium with organic materials may have a direct bearing on the genesis of some types of uranium deposits. E. N. T.

625. Moodys Branch–Cockfield contact in Sabine Parish, Louisiana, and adjacent areas. R. C. Treadwell. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 2302–23.—The Moodys Branch formation is one of the most distinctive lithologic units in the Gulf Coast plain. In this area there is small but apparent stratigraphic discontinuity between the Moodys Branch and the Cockfield formation, which underlies it. The term diastem most nearly expresses this relationship when viewed locally. E. N. T.

626. Oil possibilities in Florida. L. Jordan. *Oil Gas J.*, 15.11.54, **53** (28), 370.—The stratigraphy and structure of Florida are outlined and the oil possibilities appraised. The state has been sparsely tested, and *ca* 23½ million acres can be considered virgin territory.

The sediments are part of the Gulf of Mexico geosyncline and range from Jurassic to Recent. The major structural feature is the Peninsula arch, which trends southwards, forming the backbone of the Florida peninsula; to the N. lies the Suwannee Strait, a post-Cretaceous erosional feature separating the Peninsula arch from the Chattahoochee uplift to the north.

Oil shows have been found in the Lower Eocene, Palæocene, and Upper and Lower Cretaceous, ranging from 2600 to 13,000 ft. Potential structural and stratigraphic traps, including reefs, are believed to exist, and intensive exploration is planned.

Maps and cross-sections illustrate the geology of the area, and 3 refs are included. C. A. F.

627. Salt-dome geology may enter new phase. M. T. Halbouty and G. C. Hardin, Jr. *Oil Gas J.*, 1.11.54, **53** (26), 93.—The geology of the S. Boling field in Wharton County, Texas, is described. The field produces from Oligocene Frio sands in a closure on the down-thrown side of a thrust fault occurring on the south flank of a piercement salt dome.

The field is significant in the unique structural control of the accumulation, since the presence of thrust faults had not been recognized previously in the Gulf Coast area. It is claimed that this is of very great importance to future exploration in the salt dome region, as similar structures probably occur on other salt domes. The "shale wedges" described in other fields may be overthrust bodies overlying productive sands which have not yet been penetrated.

Maps and sections showing the structure and history of the S. Boling field are included. C. A. F.

628. New exploration possibilities on piercement-type salt domes established by thrust fault at Boling Salt Dome, Wharton County, Texas. M. T. Halbouty and G. C. Hardin, Jr. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1725–40.—The S. Boling field is structurally a closure on the down-thrown side of a thrust fault which occurs on the S. flank of the Boling piercement-type salt dome in Wharton County, Texas. To date, 10 productive Frio sands and one productive *Marginulina* sand have been established in this field. The authors discuss the significance of the thrust fault for Gulf Coast geological thinking, and its expected effect on future exploration of piercement-type salt domes. E. N. T.

629. Strawn pinchout sparks drilling at Jameson. N. S. Morrisey. *Oil Gas J.*, 22.11.54, **53** (29), 108.—The geology of the Jameson field, west-central Texas, is outlined. Oil was first discovered in 1946 in the Jameson reef, which trends N.–S. and is productive over an area 6 miles by 2 miles in Coke County. Production has since been found in Strawn sands, which pinch out eastwards over the reef; these occur in a zone 200–300 ft thick, and are produced as a single unit.

Several of the large reefs in west-central Texas may have similar sand developments. C. A. F.

630. Genesis and depositional history of Spraberry formation, Midland Basin, Texas. G. T. Schmitt. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1957–78.—The author examined a large number of thin sections prepared from the Spraberry formation of the Midland Basin, W. Texas, and developed from his examination a genetic sequence. This sequence is divided into 2 major stages and several sub-stages. E. N. T.

631. Ordovician stratigraphy in Marathon folded belt, West Texas. J. L. Wilson. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 2455–75.—Stratigraphic study of little-known Ordovician exposures S. and E. of the Marathon uplift, W. Texas, shows that a facies change exists from predominantly shaly beds of the Marathon region to more arenaceous beds in the Solitario and Dove Mountain quadrangle areas. This paper extends the stratigraphical relations previously described into less known outcrops in areas which lie respectively SW., S., and SE. from the well-known Marathon uplift. Facies changes in the units are noted, and general questions about source area, type of geosynclinal rocks, and comparisons with the Ouachita section are discussed. E. N. T.

632. Regional stratigraphical analysis of Cotton Valley group of Upper Gulf Coastal Plain. J. M. Forgotson, Jr. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 2476–99.—The Cotton Valley group of the Upper Gulf Coastal Plain is Late Upper Jurassic in age. It was first named as a formation representing the marine fossiliferous dark shale, limestone, and sandstone lying below redbeds of the Hoston formation in the Cotton Valley field of Webster Paris, Louisiana. In the present paper the result of lithologic and thickness data of Upper Jurassic rocks of the Cotton Valley group, Upper Gulf Coastal Plain, are interpreted from electric and sample logs, and selected correlations carried from Arkansas and Louisiana into Texas, Mississippi, and Alabama. E. N. T.

633. Whither Williston? F. J. Gardner. *Oil Gas J.*, 15.11.54, **53** (28), 369.—There has been intensive exploration in the Williston basin of N. Dakota, U.S.A., since oil was first found in 1951.

The basin covers 118,500 sq. miles, and contains sediments ranging in total thickness from 2000 to 12,000 ft. Most of the fields have been discovered on the major structures, such as the Nesson and Baker–Glendive anticlines, but shallow stratigraphical traps are believed to exist on the eastern flank of the basin. Exploration is made difficult by the presence of glacial drift.

A block diagram of the Williston basin and a structure map of the basement rocks are included. C. A. F.

634. Williston basin Paleozoic unconformities. W. S. McCabe, *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1997–2010.—The unconformity at the base of the Mississippian is the most pronounced of the regional unconformities existing in the Williston basin. This is primarily a Paleozoic basin, and Paleozoic unconformities are present at the base of the Middle Cambrian, Upper Cambrian, Ordovician, Middle Devonian, Lower Mississippian, Kibbey–Upper Mississippian, Middle Pennsylvanian, and Middle Permian. E. N. T.

635. Stratigraphic analysis of Upper Devonian and Mississippian rocks in Michigan basin. D. J. McGregor. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 2324–56.—Most of the area within the Michigan basin is covered with a mantle of glacial drift, and only in a few places is bedrock exposed. Recently, facies maps have been used as a basis for interpreting lithologic aspects of the stratigraphic unit. In this paper, sections from 168 oil wells have been presented in the form of an analysis

of Upper Devonian and Mississippian rocks. Sand–shale ratio and percentage of carbonate or evaporite in the total stratigraphic unit are used in the statistical analyses. Interpretation of isopach and lithofacies patterns reveals that tectonics of the depositional area is a very important factor in controlling sedimentary facies. E. N. T.

636. Cretaceous and Pleistocene section in northern end of Mississippi Embayment. B. C. Moneymaker and L. F. Grant. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1741–7.—This paper describes detailed geologic investigations of a small area in the N. end of the Mississippi Embayment. It was found that the Tertiary was not represented in the area studied, having been removed by late or post-Tertiary erosion. E. N. T.

637. Occurrence of oil and gas and its relation to possible source beds in Continental Tertiary of intermountain region. W. M. Felts. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1661–70.—This is a detailed consideration of production from the Continental deposits of the various intermontane basins of the W. Rocky Mountains, the Great Basin, and the Columbia Plateau of U.S.A. Commercial production of Tertiary oil has been obtained from only 2 of these basins to date, the Green River and the Uinta. Gas is also produced from these 2 basins, and there are substantial shows of heavy oil. The author classifies the sediments of the area on the basis of depositional loci into 2 general categories: (1) suites of sediments deposited in large lakes, which in their later histories became saline; or (2) basin fills of fluvial, paludal, and freshwater lacustrine beds associated with varying amounts of extrusive volcanics. E. N. T.

638. Arizona is added. Anon. *Oil Gas J.*, 1.11.54, **53** (26), 58.—The first producing well in Arizona has been completed; it is 2 East Boundary Butte in the NE. part of the state, which on test produced 2200 M.c.f. gas/day and 11 b.d. oil from the Pennsylvanian at 4884 ft. The well may have proved an extension of the Boundary Butte field, 8 miles NW. in Utah. C. A. F.

639. Age and stratigraphic relations of Ignacio Quartzite in southwestern Colorado. H. Barnes. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1780–91.—Recent field work suggests that the Ignacio quartzite is Devonian in age, that it forms an essentially continuous depositional sequence with the overlying Elbert formation and Ouray limestone, and that in the Animas River Valley the Ignacio has been intruded by a granite porphyry of Devonian or younger age. E. N. T.

640. Correlation of Maroon formation in Crystal River Valley, Gunnison, Pitkin, and Garfield Counties, Colorado. R. L. Langenheim, Jr. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1748–79.—The area described includes the NW. part of the Elk Range and its structural extent in the Huntsman's Hills. The author describes the possible solutions of a number of stratigraphic formations afforded by examination of the more or less continuous exposures of the Maroon and associated formations between Glenwood Springs and the Crested Butte Quadrangle. It is concluded that lateral equivalents of the Upper Maroon and Lower State Bridge siltstone is suggested by intertonguing finer-grained redbeds in the eastern outcrops of the Upper Maroon formation. E. N. T.

641. Pennsylvanian stratigraphy of Paradox Salt Basin, Four Corners Region, Colorado and Utah. S. A. Wengerd and J. W. Strickland. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 2157–99.—The Paradox Salt Basin is an elongated NW. trending sedimentational basin of Pennsylvanian age in SE. Utah and in SW. Colorado. Although now regionally high and in several localities severely folded and faulted, its early basinal characteristics are outlined by the lithofacies gradations of a complex wedge of evaporite sediments SW. of the Uncompahgre highland and E. of the Kaibab uplift. An outline is given of the structural history of the basin, its shelves and the ringing uplifts, and the complexities of marine to nonmarine sedimentation are described. E. N. T.

642. Origin of hydrocarbons of Uinta Basin, Utah. J. M. Hunt, F. Stewart, and P. A. Dickey. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1671–98.—A long-standing problem in petroleum geology is the identification of source rocks for any particular petroleum deposit. An extensive investigation has been made by the authors in the Uinta Basin area into the identification of source rocks of the local petroleum deposits by means of a combination of geological and chemical studies, using more than 2000 outcrop and sub-surface rock and hydrocarbon samples. In this area there are 4 chemically different types of free hydrocarbons, and each type is found closely associated with one particular stratigraphic unit, so that the source rock of each type can be identified by field geology. Extensive chemical data are presented, and it has been found that these data, together with supporting geological data, afford an identification of the source rocks of the Uinta Basin hydrocarbons. E. N. T.

643. Dolomites in Silurian and Devonian of East-Central Nevada. J. C. Osmond. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1911–56.—Evidence is presented to show that the increasing depth of water from the Sevy to limestone above the Simonson indicates eastward transgression of the Devonian sea. The Sevy dolomite, which is up to 1600 ft thick in places, overlies unconformably the Laketown dolomite of Middle Silurian age, and is tentatively correlated with the Lone Mountain formation of central Nevada. E. N. T.

644. Ammonite indicates Cretaceous age for part of Franciscan Group in San Francisco Bay area, California. J. Schlocker, M. G. Bonilla, and R. W. Imlay. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 2372–81.—*Douvilleiceras sp.*, an ammonite of Early Cretaceous age, was found in graywacke-type sandstone that is part of a narrow band of exposures in cliffs along the S. shore of the inlet to San Francisco Bay—an area regarded as in the type locality for the Franciscan group. The age of part of the Franciscan group as determined from the presence of this fossil is Early Cretaceous Albian. E. N. T.

645. Corcoran clay—a Pleistocene lacustrine deposit in San Joaquin Valley, California. J. W. Frink and H. A. Kues. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 2357–71.—The Corcoran clay represents a unique departure from the Continental alluvial fan deposition of the Quaternary of the San Joaquin Valley. It is massive, silty clay, highly diatomaceous, 50–120 ft thick, generally 200–800 ft beneath the surface, extending over an area greater than 4000 sq. miles. The lake in which it was deposited was probably formed by diastrophism in the Coast Range, by drowning of the San Joaquin Valley during a sea-level rise, or by construction of a fan by the Sacramento River and others east of Carqinez Strait, thereby damming the outlet of more southerly streams. E. N. T.

646. Stratigraphy of Medinan Group, New York and Ontario. D. W. Fisher. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1979–96.—An attempt is made to define the lithologic character, paleontologic content, and stratigraphic relations of the post-Cincinnatian and pre-Clintonian strata, in S. Ontario and W. New York states. This forms a very useful purpose, as difficulties have arisen in the past in the non-uniform use of terms applied to the pre-Clintonian Silurian rocks. E. N. T.

647. Late Devonian geologic history in Stettler area, Alberta, Canada. J. M. Andrichuk and J. S. Wonfor. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 2500–36.—The Late Devonian history in the Stettler area is divisible into 4 sequences of deposition comprising a major evaporite cycle. Unconformities mark the base and top of this cycle. The sequences in increasing age are: (1) final normal marine; (2) biostromal and evaporitic; (3) marine-reefoid; and (4) initial normal marine. Present study represents a detailed analysis of Upper Devonian sedimentation in a localized area where lateral stratigraphic variations can be critically studied in relation to their regional framework. E. N. T.

648. Vanadium, nickel, and iron trace metals in crude oils of Western Canada. G. W. Hodgson. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 2537–44.—All crude oils contain trace metals combined with the hydrocarbon constituents of the oils. The significance of this fact is that while the study of sedimentary geology has contributed the major part of our knowledge regarding the origin and accumulation of oil pools, the oil itself has much to contribute to the same fund of knowledge, and the study of the trace metals in the oil is a very direct and precise approach because of the relatively simple analytical methods involved.

In this paper typical crude oils from W. Canada are shown to be produced from host rocks ranging in age from Upper Devonian to Upper Cretaceous; they were examined for the occurrence of vanadium, nickel, and iron trace metals. The conen of the metals, believed to have been closely associated with the oils since genesis, varied inversely with the API gravity of the oils. In general, the vanadium-containing organic mol appears to be less stable than the nickel-containing mol, resulting in a net lowering of the vanadium–nickel ratio of the oils as the apparent age becomes older. 3 groups of Devonian oils appear to exist, and 2 of these groups appear to describe the oils produced from the Cretaceous Viking sands of Alberta and W. Saskatchewan and the Cretaceous Cardium sands of the Pembina field. E. N. T.

649. Cretaceous and some Triassic Beds of North-Eastern British Columbia, Canada. W. R. S. Henderson. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 2269–89.—The material of this paper refers to that part of a survey carried out during the summer of 1950 in NE. British Columbia relating to the Mesozoic rocks encountered. E. N. T.

650. Normal Devonian sequence in southern Mackenzie Basin, Western Canada. C. W. Hunt. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 2290–301.—Active exploratory drilling in the S. part of the NW. Territories in the northwesternmost part of Alberta and the northeasternmost part of British Columbia commenced in the spring of 1951. Drilling now shows the presence of a normal basinal sequence of strata, and the need for several new formational names is immediately evident. Such names are proposed in this paper and given definition. E. N. T.

651. Geology and petroleum possibilities in Canadian Arctic islands. Y. O. Fortier, A. H. McNair, and R. Thorsteinsson. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 2075–109.—The Canadian Arctic islands have a land area of approx 525,000 sq. miles, 306,000 of which are underlain by Cambrian and later strata. This represents the largest sedimentary region in N. America that has not had at least cursory examination by petroleum geologists.

The Arctic islands region has had a complex geological development. The most conspicuous structural element of this consists of a major orogenic system, approx 1400 miles long, that extends in 2 broad arcs from N. Greenland to the Beaufort Sea. Part of this system can be divided into 3 subparallel belts.

2 large Paleozoic miogeosynclinal basins occur S. and E. of the orogenic system. The E. basin, genetically related to the Ellesmere–Greenland fold belt, contains at least 10,000 ft of sedimentary beds that range from the Cambrian to the Devonian. The W. basin may have similar relations to the Parry Islands fold belt.

Surface indications of petroleum consist of abundant rocks having a petroliferous odour and asphaltic residues. Active oil and gas seeps have not been found. On Cornwallis Island asphaltic residues in a basal conglomerate indicate an exhumed reservoir. Marine and fresh-water oil shales and low-rank coals have been identified in several widely scattered areas. E. N. T.

652. Source-bed problem in Velasquez field, Colombia. W. S. Olson. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1645–52.—This forms the first of 5 papers on the subject of oil and gas in Continental beds. It describes the Velasquez oilfield in the Middle Magdalena Valley of Colombia, which is a long Tertiary basin. The sedimentary section here consists of approx 8000 ft of clastic Continental beds resting directly on a crystalline basement. These Tertiary beds increase as much as four-fold in thickness toward the SE., without any evidence for marine intercalations. The author believes that the source of oil and salt water in the Continental sediments in this field was in the marine Cretaceous sediments which lie unconformably below the Continental beds some miles to the east. E. N. T.

653. Wafra gets new pay. Anon. *Oil Gas J.*, 22.11.54, **53** (29), 76.—The Ratawi limestone has been found productive in the Wafra field in the Kuwait–Saudi Arabia Neutral Zone; on test it flowed 2400 b.d. of 25·6° oil from *ca* 6760 ft. The Ratawi has not hitherto been found productive in the Middle East.

15 wells are now producing from the Burgan sand at Wafra, and a wildcat, 1 Graya, is being drilled in the western part of the zone.

Current production from the field is *ca* 20,000 b.d. C. A. F.

654. Formosan gas search pushed. Anon. *Oil Gas J.*, 15.11.54, **53** (28), 169.—A gas reservoir has been discovered in the S Chinshui field in NW. Formosa. Reserves are estimated at 3 billion cu. ft. The reservoir is in the A zone, hitherto untested, which is a porous and permeable sand, *ca* 60 ft thick, in the Upper Miocene Lower Kueichulin.

Initial production was 500,000 cu. ft/day from *ca* 1800 ft. C. A. F.

655. Geological significance of discovery of oil at Rough Range, Western Australia. M. A. Condon. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 2110–18.—This paper summarizes the geological and geophysical information obtained as a result of surveys by the Bureau of Mineral Resources, Geology, and Geophysics of the Commonwealth of Australia. It describes the geological associations of the first significant flow of oil on the Australian continent encountered by a deep test in the Carnarvon basin, which contains marine sediments ranging from Middle Devonian to Miocene. The total Paleozoic thickness in the basin is estimated at between 20,000 and 30,000 ft, overlain by 3500 ft of Cretaceous and Tertiary. E. N. T.

656. Oil occurrences in coal measures of England. P. E. Kent. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1699–713.—During the present century, commercial production of crude oil has been established in the British coal measures at Eakring, Notts. The author describes the stratigraphy of the coal measures, consisting as they do mainly of non-marine strata supposed to be fresh-water, with subordinate marine intercalations which are largely restricted to the upper and lower parts.

The author concludes that most of the oil showings are not associated with coal measure marine beds and that the association of several of the oil showings with faults that range through almost all the productive coal measures supports an origin by vertical migration from the thick marine beds in the Millstone Grit beneath. However, it is doubtful even so, whether migration of 1000–2000 ft vertically through a predominantly shaly series is likely, since the fault planes are commonly sealed. Furthermore, most faults are not accompanied by traces of oil. E. N. T.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

657. Mapping shallow horizons with reflection seismograph. L. C. Pakiser, D. R. Mabey, and R. E. Warrick. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 2382–94.—The reflection seismograph has accounted for an increasingly high proportion of new discoveries each year, and today it can be regarded as indispensable to any full-scale oil-finding programme. The

U.S. Geological Survey has successfully tested specially constructed shallow-reflection seismic instruments in 2 areas in Oklahoma and Kansas. Details are given in this paper.
E. N. T.

658. Geophysics in exploration in Aquitaine. L. Migaux. *Bull. Ass. franç. Tech. Pétrole*, Nov. 1954, **108**, 471–91.—The application of geophysics in the search for oil in Aquitaine is discussed with particular reference to the geology of the known fields. Structural complexities and unconformities render the problem difficult in various cases. The limitations of gravimetric methods are examined in some detail, and examples of different types of gravimetric map are given. Electrical methods are described, again with illustrations. In some areas electrification of the railways restricts the use of these methods. Seismic reflection work has also been carried out. This is essential in the search for oil unless there is adequate surface evidence of the structure as at Saint-Marcet. Lacq was not displayed gravimetrically, and could not be examined by electrical surveys. Some well-defined structures (Roquefort, Mano, Borderes, and perhaps Audignon) are dry, and data other than structure are needed in assessing the oil prospects.
G. D. H.

DRILLING

659. Design and manufacture of oil well drilling and production equipment. Anon. *Brit. Petrol. Equipm. News*, 1954, **4** (2), 36–8.—A brief description of the building of a Ideco–Woodfield H20 rig with KM-65-100-C mast is given, and, in addition, a full range of oil production implements are listed.
E. A. G. H.

660. Pumpability of clay–water drilling fluids. I. Havenaar. *J. Petrol. Tech.*, 1954, **6** (11), AIMME Tech. Paper No. 3930, 49–55.—Few data are available for checking the validity of the various methods which have been proposed for calculating the pressure losses in drill-pipe and bit nozzles. Experiments are described in which various muds were pumped through 8 m of 1-, 2-, or 3-cm dia pipe or 1 m of 0·6- or 0·8-cm dia pipe. Nozzles were also used, while the flow properties of the muds were determined in a modified Stormer and in a motor-driven viscometer.

It is concluded that for laminar flow pressure losses can be calculated from the differential visc and Bingham yield value of the mud. In the turbulent region a good approximation to the losses can be computed from a visc based on the vol fraction of dispersed phase. The ratio of the turbulent visc of a clay–water mud and the visc of water at the same temp is practically independent of temp.

Pressure losses in nozzles appear to depend solely on the density of the mud and the geometry of the nozzle.

The theory involved is given briefly, and the experimental data are analysed graphically and in tables.
G. D. H.

661. Multi-purpose water-in-oil emulsion mud. J. L. Lummus. *Oil Gas J.*, 13.12.54, **53** (32), 106.—The use of a new water-in-oil emulsion mud is described. It has been successfully tested in the field and has the same basic properties as proprietary oil-base muds, but is non-inflammable and easy to mix. It is prepared by adding a dry, free-flowing mixture of clay, emulsifying agents, salts, and stabilizing agents to the proper ratio of oil and water. The prepared fluid has a visc of 60 cp, 1–2 gel, and 0·1 c.c. fluid loss (oil), and can be weighted with barytes to 15 lb/gal.

The mud would be useful in drilling salt and anhydrite zones, in completing water-sensitive pays, and in other specialized work.
C. A. *F.*

662. Marine operations off Seria. Anon. *Brit. Petrol. Equipm. News*, 1954, **4** (2), 44.—A description of initial construction stages of the first underwater well in the Commonwealth by the Shell Petroleum Co is given. Statistics relating to the design and foundation of the drilling platform are quoted throughout. The problem of transporting construction crews was eased by erecting an aerial cableway.
E. A. G. H.

PRODUCTION

663. Low cost method of production stimulation. A. W. Garst. *J. Petrol. Tech.*, 1954, **6** (11), 10–15.—Water-block appears to be the cause of production decline in some wells, and may arise in some types of work-over, or in wet production. Irrespective of the details of the blocking mechanism, it appears that a reduction in interfacial tension may facilitate clearance of the blockage. A series of surface-active agents were investigated first for their ability to reduce the oil–water interfacial tension, and then for their capacity to reduce water-block in suitably prepared core samples, the oil permeability before blockage, after blockage, and after treatment being used as a guide to efficacy. In field tests 1000–4000 gal of crude oil with 1% of the surface-active agent (the best was a non-ionic agent described as a polyoxyethylated sorbitol derivative of cottonseed oil) were injected into the formation and left for 12–24 hr. Of 90 wells treated, success was obtained in 39. The failures included 5 dry holes and 2 very low permeability gas formations. The cost for all 90 treatments was $32/brl of increase in daily output.

Frequently there is improvement with continued production after treatment. The optimum concn of reagent may vary with the formation. In lab tests there was a parallelism between the amount of water expelled and the improvement in oil permeability.
G. D. H.

664. Optimum sand concentrations in well treatments. P. Dehlinger, W. H. Browne, and C. O. Bundrant. *J. Petrol. Tech.*, 1954, **6** (11), AIMME Tech. Paper No. 3929, 35–40.—In formation fracture treatments sand is believed to serve predominantly as a propping agent. If this is so there may be an optimum amount which gives good propping and yet does not interfere seriously with fluid flow. On the basis of certain gross assumptions an equation has been derived relating rate of flow and the number of sand grains/unit area of fracture. The relationship gives a fairly broad max at quite a small sand concn.

Experiments have been carried out in which monolayers of sand grains of varying concn were compressed between ceramic bricks, and oil was caused to flow through the propped artificial fracture. Rates of flow were a max at fairly low sand concn (¼–2 lb/gal), and diminished with increased clamping pressure, the absolute peak moving to rather higher sand concn at the same time. The fractures were 0·025 inches wide.

In practice, the sand concn in fractures may not be the same as in the injected fluid.

Experimental investigation showed little evidence of abrasion of the rock walls by injected sand.
G. D. H.

665. Measurement of resistance to flow of fluids in natural gas wells. R. V. Smith, R. H. Williams, and E. J. Dewees. *J. Petrol. Tech.*, 1954, **6** (11), AIMME Tech. Paper No. 3928, 41–8.—In order to clarify the terminology the factors F and $\sqrt{1/F}$ occurring in flow equations have been designated, respectively, the "resistance coefficient" and the "transmission factor." 14 gas wells in 6 fields in Oklahoma, Texas, and Louisiana have been used to collect data on the transmission factors of 1¼-, 2-, 2½-, and 3-inch tubing, and 5½- and 7-inch casing. The transmission factors so determined followed the Nikuradse resistance equation for turbulent flow in rough pipes, the average absolute roughness being 0·00065 inch. The latter figure is considered to be representative of gas flow strings generally, except where there is corrosion or any other cause of undue roughness. The methods of obtaining the well data and of analysing that data are given in some detail, and it is concluded that the use of the transmission factors so obtained will allow the calculation of more accurate sub-surface pressures in gas wells than at present.
G. D. H.

666. Rotational high pressure viscosimeter. M. F. Hawkins and M. L. Kimmel. *J. Petrol. Tech.*, 1954, **6** (11), 31–3.—The instrument has a non-magnetic stainless steel rotor 4 inches long and 1 inch dia, concentrically placed in a stainless steel pressure vessel, the clearance being *ca* $\frac{1}{16}$ inch. At each end of the rotor are Alnico magnets set perpendicular to the axis of the rotor. The top magnet is for indicating purposes, the bottom magnet for driving. A constant (but variable) speed external motor has a driving magnet on its shaft, and this drives the rotor. The fluid visc is measured in terms of the distance the driving magnet must be withdrawn before the viscous torque just exceeds the torque between the magnets. The break is sharp, and is detected by a magnetized needle outside the pressure vessel at the level of the indicator magnets on the rotor. A calibration curve is given, and measurements have been compared with those obtained in a rolling sphere viscometer. G. D. H.

667. Some modern submersible pumping applications—I. W. L. Gardiner. *Brit. Petrol. Equipm. News*, 1954, **4**, 245–8.—A brief historical development of submersible pumps is outlined. These have substantial application in extracting water from subterranean sources, *e.g.* wells and mines. E. A. G. H.

668. Self priming centrifugal pump testing. J. D. C. Trusler. *Fluid Handl.*, Jan 1955, **60**, 7.—Details are given of the equipment for a pump testing house which simulates conditions in the field. The layout is shown in diagrams, and photographs show the apparatus in detail. D. J. S.

669. Defining water tables of petroleum reservoirs. C. F. Knutson. *Oil Gas J.*, 27.9.54, **53** (21), 78.—Various definitions of the term "water table" are described and compared, and it is suggested that the water table should be defined as the surface formed by the top of the zone of essential water production, or the upper extent of the water as delimited by the water–oil and/or water–gas contact. C. A. F.

670. How to use radio-active isotopes for water input profiles. J. M. Edwards and L. E. Holter. *Oil Gas J.*, 29.11.54, **53** (30), 69.—The use of radio-active isotopes for water input profiles in water-flood operations is briefly described. The method is to inject a slug of isotope (*e.g.* iodine 131) at a point ft 10 above a scintillization counter; by measuring the time taken for the slug to travel from the injector to the counter and by following the slug down the hole with the counter the velocity of the injection water throughout the borehole can be determined. A conventional γ-ray log is also run to obtain a natural background count.

Loss of injection fluid can also be detected by the decrease of radio-activity intensity. C. A. F.

671. Oil production from Upper Tertiary fresh-water deposits of West Pakistan. E. S. Pinfold. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1653–60.—The 4 producing oilfields so far discovered in W. Pakistan are in the extreme N. part of the province. There are 2 older fields, Khaur and Dhulian, which are elongate domes arranged *en echelon* along the N. side of the Soan basin, which is the main structure of the region. The 2 other fields, Joya Mair and Balkassar, are on the more gently folded S. flank of the basin, Joya Mair being a somewhat narrow fold as yet incompletely explored, whereas Balkassar is an open-dome structure in which oil is somewhat irregularly distributed. The surface oil showings in this area occur mainly in Eocene beds, more particularly in porcelaineous limestones laid down during a transition from open water marine to brackish water inland sea conditions. Oil is currently being produced at Khaur from sandstones of Nimadric system and from the Eocene limestones. At Dhulian, small quantities of heavy oil occur irregularly in the Nimadric rocks. The total production from the fresh-water Nimadric series has been to date *ca* 4,000,000 brl. E. N. T.

OILFIELD DEVELOPMENT

672. Big Mineral field exploitation—a challenge to engineers. J. M. Garlick. *J. Petrol. Tech.*, 1954, **6** (12), 9–14.—The Big Mineral field is 12 miles NW. of Sherman, Grayson County, Texas. It is partly on the shores of Lake Texoma, and extends *ca* ½ mile into the Big Mineral area of the lake. Production comes from Pennsylvanian sandstones at 3600–10,200 ft on a NW.–SE. trending anticline. The discovery well was drilled in 1951 on a seismic feature. The early well pattern was designed to give flexibility and to obtain reservoir data on the various zones, so that exploitation plans could be formulated. 6 major producing zones have been defined.

Lake Texoma is artificial, and its level variations were studied before making plans for drilling which would be acceptable to all concerned. The scheme adopted used earthen drilling platforms and access roads, a height being selected which would leave them above water for 92% of the time. The platforms were 175 ft × 190 ft, and the roads 28 ft wide at the top. The max height above the lake floor was 10 ft. Experience showed that each platform could take 3 wells. By June 1954 32 platforms and 5 miles of access roads had been built. Waste mud and cuttings were trucked from the platforms.

Oversize drill collars and jet bits improved drilling time when combined with some relaxation of hole deflection limits. A time saving of 45% was obtained on 7000-ft holes. Long cement columns have been necessary to protect the various producing horizons. The Pennsylvanian sandstones react favourably to fracture treatment. Production equipment is raised on 12-ft steel towers. Automatic controls have been installed to reduce risks of water pollution. G. D. H.

673. Drilling expands on Nesson anticline. N. S. Morrisey. *Oil Gas J.*, 25.10.54, **53** (25), 118.—The discovery of 3 new fields in the Beaver Lodge–Tioga area on the Nesson anticline of N. Dakota has stimulated exploration in this area.

The anticline is a regional feature on the NE. side of the Williston basin, and is the main producing trend in N. Dakota. Production is from the Mississippian limestone at *ca* 8000 ft.

The fields are White Earth, McGregor, and E. Tioga. White Earth and E. Tioga have less than 100 ft of closure.

Drilling and completion practice in the fields are briefly outlined. C. A. F.

674. Burbank floods promise 180 million barrels of oil. C. H. Riggs. *Oil Gas J.*, 1.11.54, **53** (26), 88.—The water flood projects in the North, Mid, and South Burbank units in Osage County, Oklahoma, are described.

In N. Burbank peak production was reached in 1922, and water injection was started in 1950; total primary production was approx 25,440,000 brl, and since injection the section has yielded approx 4,000,000 brl.

In Mid Burbank the increased recovery attributable to flooding is approx 153,000 brl or approx 235 brl/acre.

S. Burbank was discovered in 1934, and water flooding was started in 1951; peak production was reached in 1953.

Diagrams showing the locations of the water-flood units and their production histories are included. C. A. F.

675. Oil in California. G. B. Moody. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1888–910.—The author provides an analysis of California's exploratory effect and its change in reserves position from 1 Jan. 1946 to the end of 1953. It is a continuation of an earlier paper presented before the Pacific Section of the A.A.P.G. in Los Angeles in Nov. 1946. E. N. T.

676. Optimism on the West coast. F. J. Gardner. *Oil Gas J.*, 25.10.54, **53** (25), 163.—Future prospects for oil development in the western coastal states of the U.S.A., based on recent exploration, are briefly outlined.

In California these include the possibility of deep reservoirs

in the S. part of the San Joaquin Valley, where oil has been found below 17,000 ft. This area probably contains the thickest column of sediments on the continent, estimated at 65,000–75,000 ft. Offshore areas also offer good prospects.

Washington and Oregon have hitherto only yielded showings and uneconomic gas pools, but the states have been sparsely drilled. C. A. F.

677. Borneo's quest for oil. Anon. *Oil Gas J.*, 6.12.54, **53** (31), 99.—Oil developments in British Borneo are briefly outlined. These include the development of offshore productive zones in the Seria field, which is producing *ca* 100,000 b.d. and is the largest field in the Far East. Wells have been deviated from shore sites, and offshore drilling is to follow. A sea wall is to be built for coastal defence.

Seria is a faulted anticline whose axis parallels the shore; at least 30 zones are productive from a Miocene–Pliocene sand–shale sequence. Pays range in depth from *ca* 1000 to 7000 ft, and there is extensive faulting forming permeability barriers.

Crude is piped to the refinery at Lutong in Sarawak. C. A. F.

678. The problem of exploitation of the Sumecani field, Croatia. S. Galovic. *Nafta* (*Yugoslavia*), 1954, **5** (10), 271–81.—The Sumecani production field represents the highest level part of the Kriz structure. The field size is 729 acres. The base rock in the depth of 1500–2600 ft is granite or gneiss superseded by Upper Oligocene sweet-water layers of up to 650 ft strength. These are covered by second Mediterranean and Sarmate layers. On top of the Miocene layers are Pliocene layers. Crude-bearing layers are developed in the sand strata of Upper Oligocene and Lower Pliocene. The field was discovered in 1949. The reserves in the Oligocene were estimated to be 628,000 tons. Up to 1 Aug. 1954 the field gave 246,000 tons. The crude is very viscous, 17° API gravity, and the field is highly water-bearing. It was originally partially broken up in a 100 m net. Later on the 300 m net was adopted. A comparatively unsatisfactory development of the collecting system and economical reasons suggested a net more than 100 m and less than 300 m. Upon a facial and geological, as well as economic analysis, a net of 200 m, equalling 8·65 acres, per well, proved to be the most satisfactory from the engineering and technical viewpoint.

(Author's abstract.)

TRANSPORT AND STORAGE

679. Want gas-free storage tanks? D. P. Thornton. *Petrol. Process.*, 1955, **10** (1), 47–52.—A new method of gas-freeing storage tanks developed at Shell Oil Co's, Norco, Louisiana, refinery involves withdrawing tank vapours via an eductor from near the bottom and admitting air at the top through a curtain of water fog, thereby creating a minimum of turbulence and mixing. Regardless of the material, most tanks can be purged so that the atm is at least 50% below the explosive limit within one hr of commencement. J. H.

680. Oil berths at Singapore. Anon. *Fluid Handl.*, Jan. 1955, **60**, 5.—4 new tanker berths are being constructed, 3 of which embody unique features, to withstand the shock of a 60,000-ton displacement tanker berthing in deep water. Conventional dolphin construction is used in one case, but the others consist of a heavy reinforced concrete beam carried on forward raking posts. The hose handling gear is carried on a separate jetty head, and crane gear is used to give high rates of cargo handling, of the order of 1500 tons/hr. D. J. S.

681. Unusual pipeline failures traced to hydrogen blisters. F. Paredes and W. W. Mize. *Oil Gas J.*, 20.12.54, **53** (33), 99.—Intensive study of pipeline ruptures on a trunk line and gathering lines of El Paso Natural Gas Co in W. Texas indicated that hydrogen blistering was the cause of the failures. Internal corrosion supplied atomic hydrogen; and when this was stopped by organic-inhibitor injection the hydrogen blistering and pipeline failure ended. Pre-coating of pipe with chromium and molybdenum alloys or use of austenitic steels have been found satisfactory.

This is the first known occurrence of hydrogen blistering on a gas-transmission line. G. A. C.

682. Preventing damage from high-voltage surges. H. L. Hamilton. *Oil Gas J.*, 20.1.54, **53** (33), 125.—High voltages which might occur make it necessary to design insulating points for economic corrosion control on operating conditions which may be encountered. High-capacity shunts at insulating points can adequately handle such voltages, but must not be installed in an explosive atmosphere. G. A. C.

683. Predicted pressure drop proved in the field. Anon. *Chem. Engng*, 1955, **62** (1), 126.—The relationships between flow rates and friction factors proposed by Stanton and Pannell in 1914 have recently been proved correct. 15 American companies operating long lines have sent data to the API sub-committee on pipeline hydraulics, covering dia from 12 to 31 inches and lengths from 7 to 176 miles. D. J. S.

684. World's longest pipeline suspension bridge. M. J. Paul, J. E. Thomson, and R. Leach. *Oil Gas J.*, 10.1.55, **53** (36), 78.—This bridge spans the Mississippi at Grand Tower, Illinois, and carries the Texas–Illinois gas pipeline. The structure has a main span of 2150 ft and is designed to support 2 20-inch pipelines 75 ft above highest recorded water level. It will be completed by March 1955, and will replace 3 20-inch underwater crossings. G. A. C.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

685. Mandan—a new refinery in a burgeoning new refining area. Anon. *Petrol. Process.*, 1954, **9** (12), 1873.—2 months ago a new refinery was put on stream—the 30,000-b.d. plant of Standard Oil Co (Indiana) at Mandan, N. Dakota, U.S.A. J. H.

686. "Four-in-one" processing. Anon. *Petrol. Process.*, 1954, **9** (12), 1874–7.—2 main features of Standard Oil's (Indiana) 30,000-b.d. refinery at Mandan, N. Dakota, U.S.A., are that it is the largest combination processing unit yet installed in the U.S.A., integrating crude still, cracking, vapour recovery, and cat polymerization into a single sequence, and the use of the entire "bottom of the barrel" crude as cat cracking feedstock. In the cat cracking section synthetic silica–alumina is used as cat, and phosphoric acid cat in the polymerization section. J. H.

687. Three kinds of treating. Anon. *Petrol. Process.*, 1954, **9** (12), 1878–9.—Product treating facilities at Mandan, N. Dakota, U.S.A., Standard Oil refinery are separate from the combination processing unit, and consist of 3 installations, copper chloride sweetening, for blended or individual gasolines—rated capacity (based on 57° API gravity gasoline) is 25,000 b.s.d., continuous Doctor treating, for heater oil, kerosine, or virgin gas oil—rated capacity (based on 40·7° API gravity stock) is 12,500 b.s.d. and caustic treating for cat cycle stocks for use in dist fuels. J. H.

688. How Mandan handles waste. Anon. *Petrol. Process.*, 1954, **9** (12), 1880.—Disposal of waste waters containing phenols and of spent caustic soln are handled in a central system designed as part of the plant in the new Mandan refinery of Indiana Standard. All process waters from the combination unit are kept separate from other waste water. The waste water passes through a stripper, where sulphur is removed and the stripped wash water treated with bacteria to remove phenol. Caustic neutralization is handled as a batch operation. J. H.

689. Aden refinery. Anon. *Brit. Petrol. Equipm. News*, 1954, **4** (2), 40–3.—The story of the erection of this major refinery, lying between Suez and India, by the Anglo-Iranian Oil Co is recounted. There arose the necessity of providing an adequate harbour, which had to be completed within a limited period to coincide with the going on-stream of the refinery. Figures are quoted concerning the cost of the completed refinery, its throughput and resulting products, and services requirements. Mention is also made of social and welfare amenities provided. E. A. G. H.

690. Extended surface type heat exchangers. Anon. *Fluid Handl.*, Jan. 1955, **60**, 17.—Finned tube exchangers, in use in America for some years, are now being made in this country. Fins are used on exchangers when there is an appreciable difference in heat transfer properties in the fluids. They are particularly useful in double pipe exchangers, where area ratios of 8 : 1 can be obtained. The concept of fin efficiency is used in area calculations in order to refer both inside and outside coeff to a common area. The units are manufactured in standard sizes and capable of operation at standard pressures, the max being 1800 p.s.i. D. J. S.

691. Aluminium alloy heat exchangers in the process industries. W. W. Binger and H. W. Fritts. *Corrosion*, 1954, **10** (12), 425–31.—Consideration is given to the factors to be included in lab tests and to the need, in some circumstances, for field testing. The effects of cooling waters, including water treatment, steam, inhibitors, and design, are included in the paper. Examples of service experience, including the use of aluminium alloy exchangers in cracking plants, gasoline plants, lub oil service, and desulphurization units, are given. W. G. R.

692. Refinery tower internals. Anon. *Brit. Petrol. Equipm. News*, 1954–55, **4** (3), 44–6.—Glitsch "Truss-type" bubble trays and caps are considered chiefly. Some salient details of this equipment are: (1) while trays are corrosion-resistant, installation and maintenance are simplified; (2) standardization of components is achieved; (3) the extensive use of 12–14% chrome alloy steel of light gauge produces a saving in weight. Operations in the manufacture of trays and caps are also mentioned. E. A. G. H.

693. Flexible refinery design. J. W. Packie and D. L. Campbell. *Petrol. Process.*, 1954, **9** (12), 1881–4.—Flexible refinery design should incorporate variation in crude type and source, products in realistic number, quantity and quality, the optimum number and choice of processing units, a suitable range of operating conditions such as temp, pressure, yields, heat inputs, etc., and adequate provision of equipment to assure meeting design service factor and economic maintenance. J. H.

694. Reducing residual oils. J. B. Fontenot, E. C. Oden, and E. J. Verman, Jr. *Petrol. Refin.*, 1954, **33** (12), 215–19.—The low price of residual oil makes it an economic necessity to reduce the quantity produced. By a systematic approach and closely examining the residual feed oil blending components, a few minor changes in overall operations can go a long way in reducing any refinery's residual oil. R. L. R.

695. "Step wise" heat transfer calculations. E. R. Grahl. *Petrol. Process.*, 1955, **10** (1), 61–9.—The "step wise" calculations, based on dividing the heat transfer process into equal temp increments, is accurate and reasonably rapid. The effect of incremental variations of physical and/or thermal properties are included when calculating heat transfer areas and pressure drops. Comparisons of "step wise" to standard approximation methods are given, and worked examples are included. J. H.

696. The design of balanced stop valves—I. G. H. Pearson. *Fluid Handl.*, Jan. 1955, **60**, 2.—The effectiveness of the closure of globe valves is discussed, and the axial force needed to close a parallel slide valve is shown to be less. The double beat stop valve is shown to be a further improvement, but it has limitations; for example, after overhaul it may not give complete shut off; this valve is suitable for automatic control and similar applications. The mechanism of the valve is to be discussed in a further paper. D. J. S.

697. "Zipper" catalyst conveyor climbs obstacles. Anon. *Petrol. Process.*, 1954, **9** (12), 1885.—In conveying bead cat from the railroad hoppers to storage bins via intervening obstacles, Continental Oil Co employed a "zipper" belt conveyor, 4 inches wide, 527 ft long, travelling at 106 ft/min and moving 10 tons/hr with a 5-h.p. chain drive motor. Costs for unloading one hopper car (43 tons), excluding initial investment and maintenance, are $14.10 for labour (6 hr) and $0.10 for utilities. J. H.

698. Fractionator testing. R. E. Kelley, T. W. Pickel, and G. W. Wilson. *Petrol. Refin.*, 1955, **34** (1), 110–14.—Tests necessary to determine the tower capacity, point of flooding, and conditions at that point are described on a "precise" fractionator, *i.e.* one which is operated to obtain a sharp separation between 2 relatively close boiling materials (deethanizers, etc.). Under certain conditions it is possible to determine capacity of the upper and lower sections independently. The tray on which flooding occurs can be found by vapour bleeders above the trays or by differential pressure measurements which must also take into account static vapour head. The use of a recording differential pressure meter is described and analysis of results given.

The comparison between theoretical and actual capacities is outlined with references to various correlations.

A discussion of tray efficiencies concludes that short-cut methods are unsatisfactory for application to actual tower operation when reflux is close to minimum or when looking for variations caused by tray design or operating conditions. R. L. R.

699. The use and erection of the Monotower crane. E. G. Mabbs. *Brit. Petrol. Equipm. News*, 1954–55, **4** (3), 38–40.—The utility of the 5-ton Monotower crane is described; it is capable of nearly all duties in concrete framed multi-storey building construction, and hence tends toward max economy. E. A. G. H.

700. Practical finned tube design. E. J. Skiba. *Chem. Engng*, 1954, **61** (12), 182.—A method is given for the practical determination of heat transfer coeff for a finned tube exchanger. Use is made of the fin efficiency concept, which depends on the ht, thickness, and material of the fin and the film coeff. Fin efficiency enables overall coeff to be found simply, as examples show. The effect of increasing the number of fins and the fouling of the fins is demonstrated. Applications of the method are discussed. D. J. S.

701. The effect of operating variables and permeable linings upon furnace performance. C. P. Henshilwood and E. A. K. Patrik. *J. Inst. Fuel*, Jan. 1955, **28** (168), 17.—Work is described which was carried out on a furnace with a permeable floor and a conventional flue which can be used as alternative paths for effluent gases.

The effect of operating variables was studied, and a comparison was made between conventional operation and use of permeable linings in identical furnaces.

Tests were made at thermal equilibrium and in addition to the mode of operation, heat input, excess air, and thermal load were varied, each being taken at 2 levels. D. K.

702. Unilateral thickness gauges. Anon. *Petrol. Times*, 21.1.55, **59** (1499), 63.—This is Pt 2 of the article dealing with ultrasonic thickness gauges, and describes the principle of operation of 2 magnetic thickness meters. Reference to calibration curves are necessary with both instruments. Practical applications are illustrated. G. A. C.

703. How to detect hydrogen leakage in coolers and condensers. J. W. Moore and R. E. Hyzer. *Oil Gas J.*, 17.1.55, **53** (37), 109.—The Sinclair Rubber Co use a degasifier which continuously distils dissolved gases from a stream of return cooling water, and which also removes CO_2. Additionally a gravitometer differentiates between air and hydrocarbons in the dist gases. A diagram of the equipment is given. G. A. C.

ABSORPTION AND ADSORPTION

704. Thinking of adsorption? Anon. *Petrol. Process.*, 1955, **10** (1), 79–82.—A new adsorbent material, trade named "Molecular Sieves," developed by Union Carbide and Carbon Corpn's Linde Air Products Co, will separate liq and gaseous materials on the basis of a difference in mol size. Chemically synthetic zeolites, the new materials offer higher selectivity and have been developed in 2 pore sizes, 4 and 5 Å dia. A comparison is made with silica gel and activated carbon and its useful properties listed. J. H.

705. Chemical engineering fundamentals. Catalytic vapour phase reactions—I. T. E. Corrigan. *Chem. Engng*, 1955, **62** (1), 199.—Following 2 articles on catalysis and adsorption, the application of adsorption equations to cat kinetics is discussed. The basis and development of cat rate equations is considered. Derivations of rate equations in the general case and with surface reaction and desorption controlling are given. Further derivations will appear in subsequent papers. D. J. S.

706. Chemical engineering fundamentals. Catalysis and adsorption—II. T. E. Corrigan. *Chem. Engng*, 1954, **61** (12), 198.—Following the introduction of the Freundlich and Langmuir isotherms, the relation between them and the more general equations is discussed. The evaluation of the constants in the general equation is considered, and a completely worked out example of the method is given. The equations for chemisorption are shown to be applicable to cat reaction kinetics. D. J. S.

707. Higher ketones as dewaxing solvents. J. L. Tiedje and D. M. Macleod. *J. Inst. Petrol.*, Jan. 1955, **41** (373), 37.—The main considerations involved in the selection of a solvent for the dewaxing process are discussed, and a lab evaluation is given of a series of higher ketones, which are also compared with the MEK–aromatic mixtures as dewaxing solvents. It is concluded that some of the higher ketones show a definite performance advantage over the conventional MEK–aromatic blends. 3 literature refs are included. U. M.

CRACKING

708. Operating the cat cracker. Anon. *Oil Gas J.*, 17.1.55, **53** (37), 93.—A report is given on 2 panel discussions held by the Western Petroleum Refiners Association at El Dorado on improving the operation of cat crackers.

Subjects dealt with include CO_2–CO ratio, heat-balanced unit, cat–oil ratio, cat activity, slurry recycle, recycle gas oil, decant oil, thermal cracking cat cycle oils, and materials of construction. G. A. C.

709. What is the effect of feed preheat in catalytic cracking? J. W. Moorman. *Oil Gas J.*, 10.1.55, **53** (36), 68.—Increasing feed preheat results in reduced coke yield, increased plant capacity, and improved liq recovery. Degree of feed preheat actually serves 2 functions in meeting heat balance considerations for a specific type of design and process conditions, and where cat circulation rate affects product distribution for an individual unit. G. A. C.

CHEMICAL AND PHYSICAL REFINING

710. Applying low temperature processing. D. S. Goalwin. *Petrol. Refin.*, 1954, **33** (12), 168–72.—Low temp processing can be applied to wherever products of a gas stream are wasted by conventional techniques, where high purity is required, or where transportation in the gaseous state is a major element of cost. R. L. R.

711. The use of sodium in refining. M. Sittig and A. S. Hawkes. *Petrol. Refin.*, 1954, **33** (12), 193–6.—The use of metallic sodium for desulphurization and improvement of storage stability of feed stocks has many advantages. The product being improved in odour, colour, and storage stability, and reduction in dissolved gum. The process features low vol loss of product with product recovery exceeding 99%. R. L. R.

712. How to desulphurize diesel fuel. T. S. Laszlo. *Petrol. Refin.*, 1955, **34** (1), 115–16.—The increased quantities of high sulphur crude oils leads to straight-run diesel fuels with high sulphur content which must be desulphurized. This article shows that the economy of the cat process is much more favourable than that of the extraction. Even wide variations in local conditions, such as layout, chemical prices, depreciation, etc., would not reverse this relation. When quality considerations (mainly pour point and Diesel Index) are not of paramount importance, a detailed study of the cat process is well worth while. R. L. R.

713. Achieving catalytic desulphurization of petroleum distillates. L. W. Zahnstecher and C. A. Petrarca. *Oil Gas J.*, 20.12.54, **53** (33), 78.—In cat desulphurization, organic sulphur compounds are converted to hydrogen sulphide and saturated hydrocarbons by mild silicate hydrogenation with max desulphurization and minimum competing reactions. The process is divided into 3 classes, desulphurization in the absence of hydrogen, or with hydrogen recycle to produce a hydrogen partial pressure, at reaction zone but without outside hydrogen make-up, and desulphurization with both hydrogen recycle and hydrogen make-up.

Typical cat desulphurization reactions, process conditions, and economic evaluations are given in tables. G. A. C.

714. Sulphur and H_2SO_4 production in England. Anon. *Oil Gas J.*, 10.1.55, **53** (36), 87.—A review is given of sulphur and H_2SO_4 plants in England as adjunct to hydrocarbon operations. The sulphur recovery process is based on the Claus process. There are units at Stanlow, Fawley, and Grangemouth. G. A. C.

SPECIAL PROCESSES

715. Making aldehydes from petroleum. P. W. Sherwood. *Petrol. Refin.*, 1955, **34** (1), 147–53.—A study of the various routes by which hydrocarbons are converted to aliphatic aldehydes; intermediates in the manufacture of plastics, rubber, explosives, textiles, etc. Formaldehyde, being primarily derived from methanol, is the most useful, although acetaldehyde is the first in production volume, this, too, being synthesized by partial oxidn of parent alcohol or hydrocarbons, and a recent process utilizing by-product acetylene from Fischer–Tropsch gasoline process gives the aldehyde by hydration. Methods of production of the above and acrolein, together with higher aldehydes, are described in detail, with alternative processes in many cases. R. L. R.

716. Increasing ethylene yield. J. G. Seay and F. C. Fowler. *Petrol. Refin.*, 1954, **33** (12), 141–85.—The use of a pebble-heater to increase ethylene yield from ethane–propane mixtures is described. By reducing the contact time, yields of 85% were obtained at 60% conversion per pass. The main disadvantage of the process being the relatively high steam consumption. R. L. R.

717. Economics of Houdry dehydrogenation. G. F. Hornaday. *Petrol. Refin.*, 1954, **33** (12), 173–6.—Dehydrogenation

of saturated paraffins by the Houdry process offers excellent economical possibilities for the production of olefins and diolefins. The process is well demonstrated commercially, is simple to operate, and can easily be designed with sufficient flexibility to permit various types of operation. R. L. R.

METERING AND CONTROL

718. Low capacity flow control. J. Procopi. *Petrol. Process.*, 1955, **10** (1), 70–2.—Throughout petroleum processing operations, controlled volume pumps can provide a solution to many low capacity flow control problems as flow controllers, ratio controllers, and as final control elements in process instrumentation. A general equation for the capacity of a controlled vol pump is discussed, and examples are cited of low capacity flow control. J. H.

719. Quality control instrumentation—the petroleum industry's requirements. Pt I. G. C. Eltenton. *Brit. Petrol. Equipm. News*, 1954–55, **4** (3), 54–7.—The obvious connexion between this topic and economics is broken down into separate angles. Prototype development is discussed with reference to actual industrial plant. The characteristics of a good instrument are quoted, and finally an automatic dist apparatus is analysed. E. A. G. H.

PRODUCTS

CHEMISTRY AND PHYSICS

720. Chart for getting vapour viscosities. A. I. Johnson, C. J. Huang, and J. D. Kemp. *Chem. Engng*, 1954, **61** (12), 195.—A chart is given for determining vapour visc from a knowledge of the critical temp and pressure and the mol. wt. It does not apply to water, hydrogen, helium, and bromine, for which substances a further reference is given. The chart is not for use above the critical pressure or temp exceeding 1400° K. D. J. S.

721. Prediction of isothermal enthalpy changes with Berthelot's equation of state. J. H. Weber. *Petrol. Process.*, 1955, **10** (1), 83–5.—This equation can be used to predict enthalpy changes of pure substances with a good degree of accuracy up to pressures of 300–400 p.s.i.a. Use of the equation is discussed, and comparison tables are included. J. H.

ANALYSIS AND TESTING

722. New analyses for complex greases. C. B. Coenen and R. S. Urner. *Petrol. Refin.*, 1954, **33** (12), 212–14.—The increasing use of organic and inorganic additives in greases has complicated grease analyses to the extent that standard methods are in many cases no longer applicable. The ASTM are formulating new techniques using the emission spectrograph, solvent partitioning, and chromatography with considerable success and accuracy. R. L. R.

723. Separation of volatile materials by gas–liquid chromatography. A. T. James. *Mfg Chem.*, 1955, **26** (1), 5.—A concise description of the technique of gas–liq chromatography and its possibilities is given. The author believes that in time it may replace analytical dist. D. K.

724. An appraisal of the high pressure oxidation method for testing transformer oil. J. M. Ward. *J. Inst. Petrol.*, Jan. 1955, **41** (373), 29.—Tests are described on a number of transformer oils, using a slightly modified form of the high pressure oxidn method (ASTM D670-42T, Method B). The oils tested included new and reconditioned oils, Continental oils, inhibited oils, and a series of experimental oils specially prepared for investigating accelerated oxidn tests. The standard deviation of results obtained with a conventional transformer oil is given. The method was found to be simple in manipulation, requires little attention during the oxidn period, and is particularly suitable for intermittent testing. Under standard conditions the test does not distinguish between straight and inhibited oils, but can be made to do so by using soluble cat, either copper or iron. 5 literature refs are included. U. M.

725. Electronic computing—its many applications. Anon. *Brit. Petrol. Equipm. News*, 1954–55, **4** (3), 34–7.—In a general description of the 2 basic forms of computer, namely analogue and digital, many applications, including the oil industry, are discussed. Of particular interest is the speed with which the analysis of mass spectrometer work can be achieved. E. A. G. H.

GAS

726. Acetylene from natural gas. T. B. Forbath and B. J. Graffney. *Petrol. Refin.*, 1954, **33** (12), 160–5.—A high temp partial oxidn process for the conversion of natural gas into acetylene is described. By means of a solvent extraction process 99·8% pure acetylene is obtained and an operation time efficiency of at least 90%. A detailed description is given for capacities up to 60 tons/day. R. L. R.

727. Speed accounting for gas purchases. P. A. Brockwell. *Petrol. Refin.*, 1954, **33** (12), 221–3.—The use of a punched-card system to speed up the accounting for the purchase and payment of natural gas in natural gasoline plants is described in detail. R. L. R.

LUBRICANTS

728. Modern grease manufacture. Anon. *Petrol. Times*, 21.1.55, **59** (1499), 81.—The modern grease plant at the Vacuum Oil Co's Birkenhead works is described. The plant, which has been in operation one year, produces 10,000 tons of grease/year.

Receipt, preparation, and feeding of raw materials, manufacturing processes, packaging and despatch, and development of technique are subjects dealt with, and a note on services and building is given. G. A. C.

729. Planned lubrication at the Steel Company of Wales. 4. H. Harber. *Sci. Lubric.*, 1954, **6** (10), 15–18.—Lubrication equipment and practice in the hot continuous strip mills is described and illustrated as being typical of the installations in the Abbey works. Special features described in some detail include the magnetic filters and the oil cleaning installations. J. G. H.

730. A steam-turbine oil for severe conditions. Anon. *Combust. Engng*, 1955, **9** (1), 25.—Short article, including detailed specification and load-carrying diagram, giving performance of C. C. Wakefield and Co's new steam-turbine oil, Perfecto L.C. C. B.

731. Observations on some factors affecting Timken data for EP lubricants. A. K. DeArdo and E. M. Kipp. *Trans. Amer. Soc. mech. Engrs*, 1955, **77** (1), 29.—Results are reported of an investigation of variations in rubbing speed and visc variables when using the Timken machine for evaluation of EP lubricants. The results demonstrate the importance of specifying and controlling within close limits the rubbing-speed variable in the determination of Timken data, and they also suggest that this variable may be an important contributing factor to the common difficulties in duplication of Timken data among different laboratories and operators. U. M.

BITUMEN, ASPHALT, AND TAR

732. Heat effects in the roof. A. W. Rick. *Bitumen, Teere, Asphalt, Peche*, 1954, **5** (11), 361–5.—In a review of the effects of heat on roofs information is given on the use of bitumen, asphalt, and tar. R. T.

733. Bubbles in poured asphalt. A. Scheuerer. *Bitumen, Teere, Asphalt, Peche*, 1954, **5** (11), 359–60.—Bubble formation in asphalt applied to dry surfaces in buildings—floors, etc—is traced to vapour from oil brushed on to the int surfaces of the asphalt buckets. This is overcome by spraying with a special oil–water emulsion as illustrated. On roads, bubble formation by water vapour in bitumen laid on dense concrete, is improved by using a lower bitumen cont $\propto$ the cavities in the mineral mass. R. T.

734. Coming development of town streets. J. Oberbach. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (11), 355–8.—The universal problem of road construction to meet future demands—increasing number of vehicles, power, load, and speed—is vital. In the Federal German Republic a cement cover 20 cm thick is considered inadequate. A motor highway with a 20-cm mortared foundation united to 18-cm cement with 2-cm asphalt–fine cement—which damps traffic shocks, balances temp changes, prevents water pen—has been constructed. Traffic jams in towns, necessity for underground traffic or bridge streets, underground garages, and finances are discussed. Machine laying of poured asphalt has improved road construction. R. T.

SPECIAL HYDROCARBON PRODUCTS

735. Lubricants in metal working. C. H. Waetjen. *Schweiz. Arch. angew. Wiss.*, 1955, **21**, 20–5.—Metal-working processes classified and described, with indications of suitable lubricants for various types of operation and different metals. Results of tests on 4-ball machine with 8 types of oils (specified only in general terms) tabulated. V. B.

736. Oil-filled electric power cables. Anon. *Petrol. Times*, 21.1.55, **59** (1499), 72.—Specifications, manufacture, and testing oils for power cables are reviewed, and sites of cable laid underground in tunnels, etc., are named. G. A. C.

737. Vapour–liquid equilibria of C_7-hydrocarbon–furfural systems. F. H. Garner and R. T. W. Hall. *J. Inst. Petrol.*, Jan. 1955, **41** (373), 1.—Isobaric equilibrium data are presented for the systems methyl*cyclo*hexane–toluene–furfural, *n*-heptane–toluene–furfural, and methyl*cyclo*hexane–*n*-heptane–furfural, and for various constituent binary systems. The experimental data were correlated by the Li-Coull method, which was found to provide a useful criterion of true equilibrium for isobaric data. 44 literature refs are included. U. M.

738. Producing chlorinated paraffins. L. F. Hatch. *Petrol. Refin.*, 1954, **33** (12), 136–40.—A review of the production of chlorinated methanes and the 2-carbon chloro compounds. Direct chlorination of methane yielding the chloromethanes, the ratio of the 4 possible products being varied by conditions. Chloroethanes being produced from ethylene by cat vapour phase reaction with chlorine or direct hydrochlorination. Possible processes are given for production of the 3 important chloroethylenes—vinyl chloride from acetylene, using activated carbon and hydrochloric acid, trichloroethylene by dehydrochlorination of tetrachloroethane, and tetrachloroethylene by an oxidative chlorination process. Alternative processes are given in many cases. R. L. R.

DERIVED CHEMICAL PRODUCTS

739. Cumene and tetramer production. E. K. Jones. *Petrol. Refin.*, 1954, **33** (12), 186–9.—Consideration of the economics and operating conditions have proved it practicable to produce cumene, tetramer, and motor polymer in a single unit, using a feed of propane–propylene and solid phosphoric acid as cat. R. L. R.

MISCELLANEOUS PRODUCTS

740. From hydrocarbons to carbon black. D. M. Strasser. *Petrol. Refin.*, 1954, **33** (12), 177–82.—The production of carbon blacks from hydrocarbons has increased greatly, and the 3 main processes—channel, thermal, and furnace—are described; the density, purity, and particle size being the main influencing factors in the selection of the process. R. L. R.

741. England's carbon-black manufacturing. Anon. *Oil Gas J.*, 10.1.55, **53** (36), 96.—A review is given, together with location, of the carbon-black plants in Gt Britain. Annual capacity is *ca* 51,000 tons; the largest plant is situated at Avonmouth, and is owned by Philback Ltd., producing 50 million lb of furnace carbon-black a year. G. A. C.

CORROSION

742. Corrosion inhibitor checklist. M. Brook. *Chem. Engng*, 1954, **61** (12), 230.—A comprehensive list of metals, showing the inhibitor needed to prevent corrosion by particular liq, is given. 77 refs. D. J. S.

743. Corrosion resistance of cupronickel alloys containing 10 to 30% nickel. F. L. LaQue. *Corrosion*, 1954, **10** (11), 391–9.—Because of the use of these alloys in heat exchangers, where one side is exposed to various corrosive materials at high temp, the paper deals with their resistance to corrosion by corrosives other than cooling waters.

The theoretical aspects of their corrosion characteristics are discussed, and results of tests under various stresses and in various environments are given. Data collected on performance in specific service are then appended, and a discussion follows at the end of the paper. W. G. R.

744. Corrosion of refinery equipment by sulphuric acid and sulphuric acid sludges. V. J. Groth and R. J. Hafsten. *Corrosion*, 1954, **10** (11), 368–90.—After considering the characteristics of sulphuric acid soln encountered in refineries, the authors discuss materials of construction for various vessels and equipment with relation to concn, temp, pressure, velocity, and other peculiarities of the acid soln.

Results of field experience and lab tests are given, and recommendations are made respecting the selection of materials, optimum design, expected service life, maintenance procedures, and economic considerations with respect to many materials. In addition, the paper deals with welded and riveted tanks, linings, galvanic effects, and reasons for failures of containers, pipes, valves, pumps, and heater coils, and is followed by a discussion. W. G. R.

745. Sulphide corrosion cracking of oil production equipment. N.A.C.E. Technical Unit Committee I-G. *Corrosion*, 1954, **10** (11), 413–19.—Field experience with sulphide corrosion cracking of production equipment in sour gas-condensate and high pressure sour oil wells is summarized, along with data for recent field tests. Preventive measures are described and field test methods reviewed. The general status of the sulphide corrosion cracking problem as it exists is described, and future problems involved in very deep sour wells are considered. W. G. R.

746. Internal corrosion in domestic fuel oil tanks. R. Wieland and R. S. Treseder. *Corrosion*, 1954, **10** (11), 401–6.—It is shown that very rapid penetration can result from localization of the rusting action of small amounts of water in the oil if imperfect coatings, such as mill scale with breaks in the scale, thin sludge deposits, or dirt collected in the bottom of the tank, are present. The authors state that there was no indication that the fuel oil was contributing any corrosion accelerating acidic constituents.

Addition of an alkaline sodium nitrite mixture to the individual tanks has been proved to be an effective means of preventing these failures. W. G. R.

747. Galvanic anodes control induced voltages on pipelines. E. H. Thalmann. *Corrosion*, 1954, **10** (11), 367.—Well-coated transmission pipelines constructed on the same right-of-way or adjacent to electric power transmission lines can be subjected to induced voltages of considerable magnitude during lightning storms and when ground faults occur on the power line. The voltage-to-ground can be greatly reduced by lowering the distributed resistance-to-earth of the pipeline. This is achieved by means of groups of galvanic anodes distributed along the pipeline. W. G. R.

748. Extrinsic line current fluctuations seriously restrict progress of coating conductance surveys on large trunk line. G. I. Russell and L. B. Nelson. *Corrosion*, 1954, **10** (11), 400.—Line currents of unknown origin fluctuating as much as 20 amp in upstream and downstream directions necessitated averaging from 20 to 30 measurements to get one of desired accuracy during coating conductance surveys on Trans-Mountain Oil Pipe Line Co's pipeline. The author postulates these currents may be of the same nature as those observed on other pipelines in Canada and the U.S.A. They are popularly attributed to sun spots, but may be due also to large adjacent bodies of ore. The currents make it extremely difficult for engineers to make reliable electrolysis surveys or tests of cathodic protective systems. W. G. R.

ENGINES AND AUTOMOTIVE EQUIPMENT

749. Free piston gas turbine. R. P. Ramsey. *Oil Gas J.*, 17.1.55, **53** (37), 127.—A direct comparison is made between the free piston unit and a conventional crank-type engine of comparable size. Cost estimates for installing a 5000-h.p. pumping station are given. Free piston unit performance corresponds to 92% mechanical efficiency, as against 85% max efficiency with crank engines. A 1500-h.p. power turbine weighs 4000 lb; a reciprocating engine of 1300 h.p. weighs 110,000 lb. G. A. C.

SAFETY PRECAUTIONS

750. Make every man a safety man. D. P. Thornton, Jr. *Petrol. Process.*, 1954, **9** (12), 1894–7.—A completely decentralized safety programme features the efforts of Dow Chemical Co's Texas Division to bring industrial injuries to the lowest possible accident frequency. Accident frequency this year will range between 4·5 and 5 lost-time injuries per million man-hours at an employment level of 5600 people. J. H.

MISCELLANEOUS

751. West Germany's amazing comeback. G. Egloff. *Oil Gas J.*, 27.12.54, **53** (34), 198.—West German petroleum industry has increased fivefold since 1939, petroleum production is 21,000,000 brl/yr and natural gas is 3,400,000,000 cu. ft. Tables show consumption and refinery production. G. A. C.

752. A review of recent developments in Europe in petroleum chemicals. C. F. M. Mackintosh and H. Steiner. *Petrol. Times*, 7.1.55, **59** (1498), 19.—This is the first of a series of reviews to be contributed at half-yearly intervals. Synthetic rubbers, detergents, and plastics are discussed with reference to manufacture, properties, and uses. G. A. C.

753. Progress Review No. 33: Fuel in agriculture and horticulture. H. J. Hine. *J. Inst. Fuel*, Dec. 1954, **27** (167), 605.—Aspects considered are: use of fuel for glasshouse heating; the sterilization of soil by steam; warming of the soil to accelerate plant growth; sterilization of dairy utensils; grass drying; drying of grain, furnaces, burners, and fuels in particular are discussed; heating of livestock buildings; lighting of farm buildings; fuels for tractors. Tables show the consumption in Great Britain by the agricultural industry of motor spirit, vaporizing oil, and diesel oil. 12 literature refs. D. K.

754. Material requirements for the oil industry overseas. W. E. Madden. *Brit. Petrol. Equipm. News*, 1954–55, **4** (3), 50–3.—A general survey of supply and demand of materials is made with references to the Purchasing Dept of the Shell Group of petroleum companies. Statistics are graphically illustrated to compare the performance of the U.K., Europe, and the U.S.A. as suppliers. E. A. G. H.

755. Atomic energy a process tool? W. F. Bland. *Petrol. Process.*, 1955, **10** (1), 43–6.—Standard Oil Development Co is building a laboratory costing $250,000 for studying the use of atomic energy in the promotion of petroleum processing reactions, both refining and petrochemical. The laboratory, situated at Linden, N.J., uses γ-rays as a source of energy obtained from radio-active cobalt in the form of a 13-inch length of 2-inch dia pipe. The estimated operational costs are 1 million dollars over a 5-year period. J. H.

756. Electrical engineering in the oil industry. F. N. Beaumont. *Brit. Petrol. Equipm. News*, 1954–55, **4** (3), 47–9.—This discourse embodies a mainly non-technical overall review of the subject. It is resolved into: (1) refinery and oilfield electrification; (2) problems and trends of development; (3) the relation between the manufacturer and oil company engineer. Supply and installation of electrical equipment are considered from the viewpoints of adequate packing, safety in operation, and reliability. The importance of telecommunications in oilfields is also stressed. E. A. G. H.

757. Government Chemist's work department report. Anon. *Petrol. Times*, 21.1.55, **59** (1499), 68.—This is a review of H.M.S.O. publication covering the work of the Department for year ending 31 March 1954. Prevention of oil pollution of the sea, gas absorption, and palladium cat are subjects included which are of special interest to the petroleum industry. G. A. C.

758. A review of recent developments in Europe in petroleum chemicals. C. F. M. Mackintosh and H. Steiner. *Petrol. Times*, 21.1.55, **59** (1499), 73.—This is the second part of the review, and continues with consideration of synthetic fibres in the U.K., following on with new petroleum chemicals. G. A. C.

759. Air Pollution Report. Anon. *J. Inst. Fuel*, Jan. 1955, **28** (168), 37.—4-page summary of the report of the Committee on Air Pollution published on 25 Nov. 1954. A complete practical scheme for drastic reduction of air pollution in those areas affected by smog is presented. Aspects particularly considered are: industrial smoke, railway smoke, motor vehicle exhaust, domestic smoke, sulphur, research and development, and legal angles. D. K.

760. Depreciation dons a new look. W. H. Chartener and E. T. Thompson. *Chem. Engng.*, 1954, **61** (12), 171.—Details are given of several methods of calculating the rate of depreciation of plant to give lower taxes in early years and allowing greater capital expenditure. The changes in recent American law are described, and pitfalls in both new and old methods are discussed. D. J. S.

ABSTRACTS

	PAGE
OILFIELD EXPLORATION AND EXPLOITATION	
Geology	79 A
Drilling	80 A
Production	81 A
Oilfield Development	81 A
TRANSPORT AND STORAGE	81 A
REFINERY OPERATIONS	
Refineries and Auxiliary Refinery Plant	82 A
Distillation	83 A
Cracking	83 A
Polymerization	83 A
Chemical and Physical Refining	83 A
Special Processes	84 A
Metering and Control	84 A
PRODUCTS	
Chemistry and Physics	85 A
Analysis and Testing	86 A
Gas	87 A
Engine Fuels	87 A
Lubricants	88 A
Bitumen, Asphalt, and Tar	88 A
Special Hydrocarbon Products	88 A
Derived Chemical Products	89 A
Coal, Shale, and Peat	89 A
CORROSION	90 A
ENGINES AND AUTOMOTIVE EQUIPMENT	90 A
MISCELLANEOUS	90 A
BOOK REVIEWS	91 A
ADDITIONS TO THE LIBRARY	92 A

AUTHOR INDEX

The numbers refer to Abstract Numbers

Abraham, E. D., 792
Akers, W. W., 807–8
Amsden, T. W., 761
Arnold, M. H. M., 882

Baccaredda, M., 829
Baeder, D. L., 816
Baird, R. C., 785
Baistrocchi, R., 835
Baldacci, R., 867–8
Banner, E. H. W., 819
Batti, P., 828
Berg, C., 794
Berry, V. J., 774
Berti, V., 871
Bloch, H. S., 861
Bombara, G., 873, 875
Boranic, V., 788
Borelli, T., 814
Bowden, F. P., 826
Boyd, J. T., 860
Brown, J. K., 869

Caldwell, B. M., 775
Casu, B., 871
Connor, J. E., 803
Cooke, D. Y., 768
Cornell, D., 793
Costa, D., 828
Constantinides, G., 841–2
Coussemant, F., 825
Cree, J. C., 853

de Lachaux, P., 791
Delaporte, A. V., 817
Dent, F. J., 827
Dockendorff, R. L., 821
Doll, R., 860
Downing, J. A., 768
Dummett, G. A., 797
Dunham, R. J., 762

Emerson, B. W., 771

Fate, D. R., 776
Fentress, G. H., 769
Foster, A. L., 848
Fourtel, R., 854
Friedman, B. S., 804

Garner, F. H., 872
Gasparotti, F., 835
Gatti, E., 846
Gaye, F. L., 770
Geffen, T. M., 774
Grindod, J., 851
Groff, J., 854
Hale, A. R., 872
Havemann, H. A., 850
Heron, A. E., 837
Hirsch, P. B., 869
Horstman, W. G., 782
Huebotter, E. E., 771
Hunt, E. B., 774

Jäger, A., 870
Johnston, J. J., 776
Jungers, J. C., 825

Kattwinkel, G., 870
Katz, D. L., 831
Keane, C. C., 784
Keeling, H. J., 876
Kelly, R. B., 790
Killer, M., 832
Kristensen, H., 809

Leidl, G., 877
Lester, C. B., 786
Lorengel, E., 834
Luther, H., 834

McCaslin, J. C., 766
McClure, G. M., 792
McCracken, E., 764
Maffezzoni, U., 845
Manci, C., 871
Mansfield, W. P., 849
Mattix, E. D., 818
Merriam, D. F., 763
Milazzo, G., 798
Miller, C. B., Jr., 843
Mize, W. M., 780
Monnot, G., 824
Morrisey, N. S., 844
Moyal, M., 777

Narasimhan, T. L., 850
Natarajan, A., 850
Nedelmann, H., 864
Nijboer, L. W., 858

Offeringa, J., 775
Owen, H. C., 773

Padovani, C., 846, 871, 877
Paredes, F., 780
Parish, C. E., 793
Parker, I. M., 782
Pedrazzini, C., 829
Petroleum Gases Panel of Institute of Petroleum, 840
Picard, A. D., 765
Pickel, T. W., 790
Pollock, A. W., 805
Poor, W. B., 781
Pratt, H. R. C., 822

Ramsey, R. P., 878
Rao, M. R. K., 850
Rasmuss, J. E., 767
Reay, W. H., 812
Rhea, T. R., 879
Rodrigues, F., 801

Samuelson, C. J., 799
Sanford, R. A., 804
Scearce, F. A., 771
Schilling, A., 854
Schneider, F. N., 774
Sherwood, P., 813
Sherwood, P. W., 862–3, 866, 874
Shideler, N. T., 783
Siegmund, C. W., 816
Sinframed, C., 871, 877
Snell, C. T., 865
Snell, F. C., 865
Stahmer, A. M., 778
Stewart, C. R., 774
Stewart, D. E., 836
Stiles, R., 815
Stormont, D. H., 795, 881
Susa, E., 828

Testini, A., 814
Teruin, G., 830
Thoenes, H. W., 833
Thring, M. W., 823
Traina, G., 847

Valussi, S., 841–2
van den Berg, G. J., 800
van der Poel, C., 775
Vogelpohl, G., 855

Wackler, R. S., 861
Walsh, T. J., 801
Whittier, F., 783
Williams, R. B., 821
Wilson, D. L., 772
Wilson, G. W., 780
Withers, J. G., 853

Ziegler, K., 806

OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

761. Lithofacies map of Lower Silurian deposits in Central and Eastern United States and Canada. T. W. Amsden. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 60.—The data used in constructing the lithofacies map in this paper were obtained by calculating the lithologic ratio from described outcrop and well sections. These calculations were made by determining the sand–shale ratios and the clastic ratios according to the method given by Krumbein and Sloss.

The information on which these calculations are based has been compiled almost entirely from the published record. The writer has examined Lower Silurian strata in several different areas, but the thickness, lithologic ratios, and faunal distribution herein used are taken very largely from the published sources given at the end of the text. E. N. T.

782. Pennsylvanian conglomerates, structure, and orogenic history of Lake Classen area, Arbuckle mountains, Oklahoma. R. J. Dunham. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 1.—This paper presents the results of detailed mapping of *ca* 15 sq. miles on the N. side of the W. Arbuckle mountains in Oklahoma. It is shown that mountain-making in this part of the mountains did not occur as a single movement in Late Pennsylvanian time, but merely culminated then. It began in Middle Pennsylvanian and ended in Permian or later time, 5 distinct pulsations being recorded in the area.

Outcrops of the Middle Pennsylvanian (Des Moines) Deese formation, the first to be discovered on the N. side of the W. part of the mountains, record the initial pulsation. This formation rests unconformably on the Mississippian Caney shale and contains a conglomerate composed of limestone boulders derived from beds at least 4500 ft and probably 9000 ft stratigraphically lower. During the second and culminating pulsation (probably Virgil), the Deese and older strata were steeply folded into generally parallel, overturned anticlines and synclines. Somewhat later the overturned folds were broken by many branching faults, and fold axes were displaced as much as a mile.

In the fourth pulsation (still Virgil), there was renewed slippage on old faults and perhaps creation of a few faults. This pulsation affected the Virgil Collings Ranch conglomerate, displacing it only a fraction of the amount shown by the beds below the conglomerate, but failed to affect the younger Virgil Vanoss conglomerate. The final pulsation folded the Vanoss

conglomerate to dip as much as 40°, rejuvenating the old faults in one locality. E. N. T.

763. Jurassic rocks in Kansas. D. F. Merriam. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 31.—This study was made in order to obtain information on the geological history of W. Kansas and surrounding areas. In this region, Jurassic rocks occur in the sub-surface, but little descriptive work has been previously done.

The rocks consist primarily of shale, sandstone, and limestone, with minor amounts of chert and anhydrite. 2 lithologic units which are recognizable in the formation are persistent and traceable over large areas. The upper unit consists of sandy shale with limestone stringers; the lower unit consists of shale with chert and anhydrite. E. N. T.

764. Correlation of insoluble residue zones of upper Arbuckle of Missouri and Southern Kansas. E. McCracken. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 47.—One of the main problems of Missouri stratigraphy has been the separation of the members and formational units of the rocks of pre-St Peter age. The original field work by Ulrich was based on fossil study, but this has been found impractical because the fossil content is negligible. The rocks consist of a number of dolomites of similar lithologic appearance with a few sandstone members.

The author herein describes how insoluble residues have been used in the upper Arbuckle series. The standard pre-St Peter geologic column of Missouri, based on residue zones, may be used in Kansas as well as other Mid-Continent states by residue methods. E. N. T.

765. Sub-surface stratigraphy and lithology of Breen River formation in Uinta basin, Utah. A. D. Picard. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 75.—Recent drilling in the Uinta basin, Utah, has made available new information on the lacustrine sediments of the area. The purpose of this paper is to discuss the lacustrine depositional environment of the Green River (Eocene) formation in sub-surface stratigraphy. An understanding of lacustrine sediments is economically important because of oil produced from the Eocene in the Uinta basin.

Information for this study was obtained by examination of well samples, and by reconnaissance field trips to check new observations concerning the sediments. E. N. T.

766. Wildcat along the Oregon trail. J. C. McCaslin. *Oil Gas J.*, 13.12.54, **53** (32), 193.—The geology of Oregon, where a wildcat is to be drilled near the Idaho border, is outlined. There are 2 basins of interest located in a complex region containing interbedded volcanics and sediments of Tertiary age; these are the Harvey and the Vale–Ontario basins.

The Harvey basin contains over 4000 ft of volcanics interbedded with river and lake deposits ranging from Miocene to Recent. Unsuccessful wildcats have been drilled in the basin, but gas shows have been reported.

In the Vale–Ontario basin, where the wildcat is to be drilled, the proportion of sediments is higher, and gas has been found in domestic quantities in some artesian wells. 2 refs. C. A. F.

767. Peru pushes search for new reserves. J. E. Rassmuss. *Oil Gas J.*, 27.12.54, **53** (34), 238.—Oil prospects in the N. part of the coastal area of Peru are appraised, and the geology of the area is described.

The oil-bearing area can be divided into 3 sections: the producing fields between the Chira river in the S. and the Quebrada Mancora in the N.; the Sechura Desert; and the N. coastal area from Quebrada Mancora to Tumbes and the Ecuadorian frontier in the N. Prospects in the N. coastal area are favourable. The Salinas formation, which produces to the S., is thick, and oil shows have been found. Other sands have shown good potential reservoir conditions, and there are potential cap rocks. Favourable structures can be found in uplifted and tilted blocks such as the Santos Martinez block. The Punto Bravo structure and the Caneas anticline have interesting prospects, as well as structures farther north in the Plateritos area. Conditions in northernmost Zorritos, where the Eocene oil-bearing sequence is missing, are less favourable. 8 refs. C. A. F.

768. Distribution of reefs of Woodbend group in Alberta, Canada. J. A. Downing and D. Y. Cooke. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 189.—Reefs and reef complexes of the Woodbend group form the reservoirs which account for 72% of the oil now produced in Alberta. The Woodbend group of Upper Devonian age consists of a series of marine shale and carbonates and local reef bodies, and occurs in the subsurface throughout the Alberta basin. Correlative rock units are also exposed in the Rocky Mountains west of the basin. 4 distinct areas of known reef distribution in Alberta are apparent; they are: (1) the Peace River area; (2) the Central Alberta area; (3) southern SE. Alberta and the Rocky Mountains area; and (4) NE. Alberta. In these regions there are definite reef trends, and the most pronounced of these is the Morinville–Rimbey trend of Central Alberta. E. N. T.

769. Little Beaver field, Colorado, a stratigraphic, structural, and sedimentation problem. G. H. Fentress. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 155.—The Little Beaver field of the Denver–Julesburg basin is in Washington and Adams counties of NE. Colorado. It is remarkable in that it was discovered by promotional means without the aid of the seismograph or surface work. The discovery well was drilled in Sept. 1950, and development followed around this well. After a slow beginning, the field gave greatly increased production, and by Aug. 1954 85 oil wells and 9 gas wells had been completed in 2 sand members. These are termed the "D" and "J" sands, and are members within the Dakota Group of Cretaceous age. The oil- and gas-bearing structures are found is sand-bar types of stratigraphic traps on a prominent nose or terrace-type feature where little or nor reversal has been noted. E. N. T.

DRILLING

770. Low-solids mud prevents hole trouble. F. L. Gaye. *Oil Gas J.*, 13.12.54, **53** (32), 115.—The properties and uses of mud containing sodium carboxymethyl-cellulose (CMC) are described. CMC muds enable high sp. gr. solids to be added to the system with a much lower concn of a colloidal suspension, and its plastering and adhering properties give effective wall building in the well bore. It is also effective in tending to stabilize dispersions and as an emulsifying agent.

CMC mud has been tested in several areas, and has proved more economical than conventional muds under similar drilling conditions. It is claimed that they have helped considerably to reduce lost circulation problems in the Louisiana Gulf Coast area; occurrences of stuck drill pipe have also been reduced. C. A. F.

771. Saturated salt-water emulsion mud solves Williston problem. E. E. Huebotter, B. W. Emerson, and F. A. Scearce. *Oil Gas J.*, 13.12.54, **53** (32), 109.—The use of saturated salt-water emulsion muds to prevent caving in the Williston basin, U.S.A., is described. It has been found to be satisfactory in drilling salt beds without dissolving them, provided salt is maintained in the mud sufficient to saturate the water phase at the mud temp opposite the salt beds.

The mud is much more costly than previously used gypsum base muds, but it will prevent caving and consequent casing failures after completion.

The new mud also prevents enlargement of shale sections; no reduction in drilling rate has been observed.

Comparative caliper logs show hole dia for non-saturated salt-water mud, and saturated salt-water muds at 80° F and 130° F. C. A. F.

772. Here's a non-fluorescing drilling fluid. D. L. Wilson. *Oil Gas J.*, 13.12.54, **53** (32), 117.—A non-fluorescent emulsion drilling fluid is described; it has the requirements of conven-

tional emulsion fluids, but does not interfere with the examination of core samples and cuttings under U.V. light.

Non-fluorescent oil is emulsified with a conventional oil-free, water base drilling fluid by agitating with a suitable emulsifier. The results of field experiments in California and Louisiana are reported, and it is indicated that the new muds can present minor problems in logging, since the appearance of free oil in a mud-cutting mixture is said to be different from that in a water clay-base mud. C. A. F.

PRODUCTION

773. New tool for perforating casing below tubing. B. M. Caldwell and H. D. Owen. *J. Petrol Tech.*, 1954, **6** (12), AIMME Tech. Paper No. 3961, 29–36.—The original perforating guns which could pass through 2-inch tubing in permanent-type well completions were not so effective as could be wished for several reasons, such as restriction in charge size and distance through the well fluid to reach 5½- or 7-inch casing. A new expendable shaped charge perforator has been developed. The charges are run through the tubing in a vertical position, but pivot to a horizontal position when at the required depth. The construction of the perforator is described, together with the safety precautions and use in the field. The results of experimental perforating are given.

Although the standard length is 10 ft, the gun can be cut to a shorter length, or linked to give as much as 45 ft. It can operate at temp of 300° F and pressures of 10,000 p.s.i. G. D. H.

774. Role of bubble formation in oil recovery by solution gas drives in limestones. C. R. Stewart, E. B. Hunt, F. N. Schneider, T. M. Geffen, and V. J. Berry. *J. Petrol. Tech.*, 1954, **6** (12), AIMME Tech. Paper No. 3962, 21–8.—Limestones form 2 broad groups in terms of the nature of their porosity. In one group there is fairly uniform intergranular porosity, in the other intergranular porosity is associated with soln cavities, fractures, etc., giving non-uniform porosity. The recovery of oil by soln gas drive is discussed, and lab experiments have been carried out to find the effects of certain factors such as gas saturation, number of bubbles, and pressure drop. The experimental data show that the efficiency of oil recovery from non-uniform porosity limestones increases with increase in number of gas bubbles formed, and the rate of pressure decline is important in establishing the number of gas bubbles. However, there are practical difficulties in using field pressure decline rates in lab experiments, but it is suggested that lab external gas-drive data can be used to predict conservatively the gas-drive performance for non-uniform porosity limestones. It is considered possible that increased recovery from reservoirs of this type may be obtained by rapidly reducing reservoir pressure for a short period, and this needs further study. G. D. H.

775. Displacement of oil from porous media by miscible liquids. J. Offeringa and C. van der Poel. *J. Petrol. Tech.*, 1954, **6** (12), 37–43.—Since the recovery efficiency of high-visc crudes by water-flooding is low, the possibility of initial flooding with a miscible low visc solvent has been considered. Before undertaking experiments scaling rules were deduced and checked by tests on sand-filled tubes of various sizes. In the experiments using kerosine to displace the crude, break-through recoveries in unconsolidated sands were equal to those obtained with water-flooding. After break-through the kerosine was more efficient than water, and this effect was greater the higher the oil–solvent visc ratio. However, large volumes of solvent are needed. If, after break-through, the outflowing liq is re-circulated, the amount of kerosine needed can be cut markedly, without reducing oil recovery.

Although much of the solvent could be recovered by subsequent water-drive, the method is not yet attractive economically. G. D. H.

776. Pressure maintenance at Abqaiq. J. J. Johnston and D. R. Fate. *Oil Gas J.*, 27.12.54, **53** (34), 181.—Pressure maintenance operations by gas injection, started in 1954 in the Abqaiq field of Saudi Arabia, are described. The field is an anticline covering *ca* 90,000 acres, 25 miles by 6 miles, with a limestone reservoir having intergranular porosity at *ca* 6800 ft. There are *ca* 40 producing wells, and 2 wells high on the structure have been converted for gas injection.

Pressure maintenance has been introduced because of a rapid fall in reservoir pressure since the field was discovered in 1946 and a corresponding decline in well potential. Initial problems of plant operation have been solved, and an injection rate of *ca* 150,000 M.s.c.f.d. is planned in order to maintain a reservoir pressure of approx 2500 p.s.i.g. at 6500 ft sub-sea.

The gas-injection plant is briefly outlined, and a diagram of the equipment layout is included. C. A. F.

OILFIELD DEVELOPMENT

777. Parentis find stirs French oil hopes. M. Moyal. *Oil Gas J.*, 27.12.54, **53** (34), 202.—Development of the Parentis field in SW. France is outlined. The field was discovered in March 1954, and it is estimated that it will meet 25% of the country's oil requirements within 4 years.

The discovery well was located on a seismic anomaly and produced on test *ca* 1100 b.d. from approx 7350 ft. Crude is high grade (34°) with a very low sulphur content, and cumulative production to the end of September was 309,000 brl.

Oil is transported by rail from the field to the refinery at Port Jerome near Paris, but a pipeline to extend from Parentis to Verdun is proposed. Crude could then be moved by tanker to the refinery. C. A. F.

778. Expanded drilling and refining boosts West German oil operations. A. M. Stahmer. *Oil Gas J.*, 27.12.54, **53** (34), 219.—New fields were discovered in all the exploratory areas of W. Germany during 1954. Most outstanding was the discovery of commercial oil and gas in the Bavarian Molasse basin following intensive geophysical work and wildcatting. Stratigraphical traps have been found in Hanover and Holstein, and further traps of this type may be found. 12 new oil and gas fields were found during the year.

Details of these discoveries and of the refinery expansion are included. C. A. F.

TRANSPORT AND STORAGE

779. Pipeliners see big year in 1955; review expansion last year. Various. *Pipe Line News*, 1955, **27** (1), 23–33.—Reports from 29 companies review activities in 1954 and anticipate increased expansion in 1955, especially for natural gas line systems. B. A. F.

780. Hydrogen blisters in gas transmission lines and preventive methods. F. Paredes and W. M. Mize. *Pipe Line News*, 1955, **27** (1), 42–52.—Hydrogen, produced by corrosion of the pipe wall, was found to be responsible for the formation of blisters on the inner wall. Breaks, originating at a blister, followed a sinusoidal path, and the line was ruptured for considerable lengths. Suppression of corrosion by organic inhibitors was successful in eliminating the formation of hydrogen and hence hydrogen blisters. B. A. F.

781. Evaluation of economic factors affecting the design of gas pipelines. W. B. Poor. *Pipe Line News*, 1955, **27** (2), 27–8.—Designers must take account of the type and size of market, optimum relation of pipe dia, and compressor station spacing, as well as the governing construction codes and the location of the pipeline in order that the facilities provided may be economically competitive with other types of fuel. B. A. F.

782. Filtering practices. W. G. Horstman and I. M. Parker. *Pipe Line News*, 1955, **27** (2), 29–36.—Results of a survey of 31

pipeline operating companies are given, and the relation of filtering to storage, corrosion control, and metering are discussed. B. A. F.

783. Cold applied coal tar coatings. N. T. Shideler and F. Whittier. *Pipe Line News*, 1955, **27** (2), 50–9.—In recent years the simple soln of coal tar pitch in aromatic solvents have been augmented by coal digestion pitches, water dispersions, asbestos-filled coatings, and combinations of coal tar pitches and synthetic resins. Mineral fillings of silica, slate flour, etc., make possible thicker applications of the coatings of *ca* 15 mil. In general, these coatings are tough and flexible, completely impervious to water, and resistant to mild chemical attack, but are subject to wrinkling when exposed to sunlight. B. A. F.

784. What's new in pipeline electronics? C. C. Keane. *Oil Gas J.*, 7.2.55, **53** (40), 92.—This is a general review of the use of electronics in tanks and pipeline practice, and concerns transmission of meter-readings, use of new magnetic principle and its application to volume meters, applications in multiple ticket printing, maintenance of lines at major river crossings, and leak detection. G. A. C.

785. Wind induced pipeline bridge vibration and its cure. R. C. Baird. *Pipe Line News*, 1955, **27** (1), 34–41.—Oscillations having an amplitude of 5–6 ft and a frequency of 19·3 cycles/minute were observed in the span of the 1020-ft pipeline suspension bridge across the Colorado River at Blythe, California. It was feared that fatigue failure would result from the continued flexing. The correlation between wind velocity and direction, and pipeline oscillation led to the conclusion that low velocity winds, following the path of the river (*i.e.* at right angles to the span), were the cause of the motion. Wind tunnel tests on a $\frac{1}{18}$ scale model were used to test mechanical damping, but mechanical damping was abandoned in favour of an aerodynamic method. Saw-tooth panelling was attached to the pipe and effectively prevented the formation of "in-phase" wind eddies and eliminated oscillation. B. A. F.

786. Hydraulics for pipelines. Pt VII. C. B. Lester. *Pipe Line News*, 1955, **27** (2), 44–9.—The use of flow formulæ is discussed. B. A. F.

787. Service pipeline job establishes new construction record. Anon. *Pipe Line News*, 1955, **27** (1), 21–2.—In order to avoid severe winter conditions the laying of the 625-mile, 20–24-inch line from Laramie to Freeman was speeded up and completed in 61 days. B. A. F.

788. Crude pipeline Burjani–Popovaca–Gracenica–Sisak. V. Boranic. *Nafta* (*Yugoslavia*), 1954, **5** (11), 305–10.—The article briefly deals with the fundamental characteristics of the crudes of the oilfields planned to be connected with the Sisak refinery, as well as the quantities to be perspectively transported. A description of the main features of the pipeline and of the manner of transport follows. The main objects of the article are the economic elements of investment and transport cost and the rentability of the pipeline *v.* railway transport. (Author's abstract.)

789. Little Aden to Aden pipelines. Anon. *Fluid Handl.*, 1955, (62), 65–8.—Construction and operation of 6-inch and 16-inch pipelines for transportation of over 2 million tons p.a. of products from Aden refinery to bunkering depot are described. Go-devils, incorporating radio-active isotopes, are used to segregate different products, their approach to depot being signalled by Geiger counter. Details of go-devil traps given. B. S. W.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

790. Fractionator testing. R. E. Kelly, T. W. Pickel, and G. W. Wilson. *Petrol. Refin.*, 1955, **34** (2), 159–65.—The second part of an article on testing fractionators, now dealing with crude fractionators, the cases of crude dist and cat cracking unit fractionators being taken as typical. Capacity tests to determine the spilling point at various liq and vapour rates are discussed, and the procedure for determination of the capacity of each section of the tower studied. Methods of determining spilling point are compared. The analysis of the test data from the internal loadings to give downcomer and vapour velocities, tray pressure drops, and liq level is discussed and compared with other methods and correlations. The application of the calculations to tower operation is dealt with briefly, and an example of the method of tower analysis is worked out in detail from experimental data obtained from a cat cracking primary unit. R. L. R.

791. Use of residual fuels in refinery boiler plants. P. de Lachaux. *Bull. Ass. franç. Tech. Pétrole*, 1955, (109), 3–16.—Considerations governing use of gas and asphalt. Gas combustion can be of 3 types, on refractory surface, no flame; blue flame, if at least 50% air is admixed prior to flame; luminous flame. Requirements of gas conduits are described, causes of gas explosions considered, and procedure for safe ignition of gas burners detailed. Control complications can arise when joint gas and oil firing is employed, control by inter-relating steam flow with flue gas flow is satisfactory, and procedure is described, with flow chart of this system as installed at Dunkirk refinery. Asphalt, an insufficiently used fuel, can be burnt if visc is lowered to 50 cs, either by heating to *ca* 230° C or, if flux is used, to lower temp. Asphalt pumps and heating of asphalt lines are briefly described. V. B.

792. Stresses in branch connections. E. D. Abraham and G. M. McClure. *Petrol. Refin.*, 1955, **34** (2), 117–20.—Strain gauge measurements were made on 7 unreinforced branch connexions on 26-inch dia line and 3 sizes of branch connexions on 24-inch pipe. The region of max stress was found to be very narrow and adjacent to the intersection of branch and header, diminishing very rapidly within a short distance of the weld, usually one branch dia. Stresses in the 3 different size branches when subjected to internal pressure are compared and also stresses during a transverse bend test. Burst tests were also carried out. R. L. R.

793. Vent lines. C. E. Parish and D. Cornell. *Petrol. Refin.*, 1955, **34** (2), 121–3.—A new design procedure for pressure relief lines and systems for real gases based on the Mollier diagram and Fanno equation is presented. As a worked example shows, the calculations are more involved than the ideal gas soln, but the results are claimed to be more reliable in the majority of cases. R. L. R.

794. Mechanical features of the Hyperforming process. C. Berg. *Mech. Engng, N.Y.*, 1955, **77** (1), 19.—A description of a 1100-b.d. Hyperformer for reforming and stock upgrading of straight naphthas and blends of straight-run and cracked stocks is given. The cat is cobalt–molybdate on a stabilized alumina base, and the reactor operates at 870° F and 400 p.s.i.g. T. T.

795. Washington gets first major refinery. D. H. Stormont. *Oil Gas J.*, 14.2.55, **53** (41), 113.—A description is given of the Petroleum Corpn's refinery at Ferndale, Washington.

The capacity is 35,000 b.d., but can be increased to 45,000 brl for gasoline and dist fuel-oil manufacture. Units include crude topping, vacuum dist, visbreaker, Thermofor cat cracker, Sovaformer, and a U.O.P. cat polymerization plant.

Boiler plant, water supplies, fire fighting, and wharf facilities are described. G. A. C.

796. British Columbia plant Nord on Stream. Anon. *Oil Gas J.*, 14.2.55, **53** (41), 121.—A brief description is given of the Standard Oil Co's 11,000-brl refinery at North Burnaby, British Columbia. Alberta crude is processed in 2-stage crude dist units, and in cat cracking and polymerization units. There are also gas-recovery facilities. High-grade motor fuel and light burning oils are produced. G. A. C.

DISTILLATION

797. Azeotropic and extractive distillation. Pt III. Azeotropic processes. G. A. Dummett. *Petroleum, Lond.*, 1955, **18** (2), 41–5.—Each application of azeotropic dist has its own characteristics. The dehydration of pyridines is discussed as an example of the simplest type of binary azeotropic separation. Ternary azeotropes and the dehydration of alcohol by the "Usines de Melle Vth Technique" are considered and line diagrams given.

The separation of toluene from non-aromatics can be carried out using acetone as an entrainer without azeotrope formation. This process is more economical in both capital and operating costs than the usual methyl alcohol process. J. B. S.

798. Column head for fractional distillation. G. Milazzo. *Chim. e Industr.*, 1955, **37** (2), 115–16.—A column head for lab fractional dist apparatus is described. The column head includes a device for the reflux ratio control, which presents the following advantages: continuous regulation up to very high reflux ratios; elimination of any leakage due to capillarity and to evaporation; no possibility of the needle being stuck in its seat; elimination of any possible contamination of the dist. (Author's summary.)

799. Hydrogen chloride from crude oil *vs* salt content. C. J. Samuelson. *Petrol. Engr*, 1954, **26** (13), C31–4.—Hydrogen chloride evolution on dist of crudes presents a serious corrosion problem. 4 oils were desalted to various degrees and the raw and desalted samples dist under simulated refinery conditions to determine HCl evolved. Concluded that HCl evolution might result from hydrolysis of salts or from metathetic reaction of salts with non-volatile acids. Hydrolysis cannot account for all HCl evolved, and high mol. wt. non-volatile organic acids might, by metathesis at temp encountered, account for much of it. Desalting considerably decreases corrosion in refinery operation. J. B. S.

800. The application of turbogrid trays in the petroleum industry. G. J. van den Berg. *J. Inst. Petrol.*, Feb. 1955, **41** (374), 45.—The flow of characteristics of the turbogrid and the factors influencing its performance are surveyed. Bubble-cap tray and turbogrid tray design are compared for some typical applications in the petroleum industry, and some plant performance data are also given. Discussion on the paper is included. U. M.

801. Nomographs for Lewis-Matheson distillation calculations. F. Rodriguez and T. J. Walsh. *Industr. Engng Chem.*, 1954, **46** (12), 2509–11.—In the method outlined, an easily constructed nomograph eliminates the trial and error process for plate temp calculations. Other nomographs applicable to dist calculations are given. B. A. F.

CRACKING

802. The T.C.C. unit at Coryton. Anon. *Petroleum, Lond.*, 1955, **18** (2), 46–9.—This air-lift Thermofor cat cracking plant employs the moving bed cat principle.

A feed of gas oils, slack waxes, etc., after preheating and vaporizing, flows concurrent with the cat and the liq feed from a spray nozzle contacts the falling cat curtain. The cracked vapour is quenched and then fractionated, giving 4 streams: recycle oil, dist fuel oil, naphtha cut, and gasoline overhead. A residual fuel oil is withdrawn from the base of the column. The cat is regenerated by air blowing. J. B. S.

803. Benzene production over catforming catalyst. J. E. Connor *et al.* *Industr. Engng Chem.*, 1955, **47** (1), 152–6.—Data on the effect of operating conditions and feed composition for benzene formation over a platinum on deactivated silica–alumina cat is given. The dehydrogenation of *cyclo*hexane rapidly approaches equilibrium over a wide range of conditions. The dehydroisomerization of methyl*cyclo*pentane is best performed at lower pressures, since side reactions are avoided. At lower pressures (175 p.s.i.g.) and low liq space velocities (1·5 vol/vol/hr) a conversion of 90% naphthenes can be obtained with only a 3% loss to undesirable by-products. B. A. F.

804. Reforming with carbon catalysts. R. A. Sanford and B. S. Friedman. *Industr. Engng Chem.*, 1954, **46** (12), 2568–71.—Improvement of the octane No. of straight-run naphthas can be accomplished by dehydrogenation and limited cracking using activated charcoal cat. Sodium salts and bases promote dehydrogenation and retard cracking, giving a product high in olefins and aromatics. Other alkali salts have the opposite effect on activity and selectivity. Steam is used as a diluent, to provide heat for the endothermic reaction, and also at high temp to regenerate the cat, the regeneration being greatly accelerated by the presence of any alkali impregnant. B. A. F.

805. Cracked cat naphtha? A. W. Pollock. *Petrol. Refin.*, 1955, **34** (2), 127–8.—The thermal cracking of cat naphtha produces higher yields of high octane gasoline than from straight-run naphtha. If spare thermal capacity is available it is suggested that if there is a problem of overlap, the yield of high octane gasoline can be made up by thermal processing of cat naphtha. R. L. R.

POLYMERIZATION

806. Guided polymerization of ethylene and its homologues. K. Ziegler. *BrennstChemie*, 1954, **35** (21–2), 321–5.—By reaction of C_2H_4 with $Al(C_2H_5)_3$ at 100°–120° C chain growth normally occurs giving higher Al-alkyls as sole products. At higher temp displacement through C_2H_4 from the combination with Al results in increasing α-olefin formation. These olefins react with Al-alkyls at high temp, yielding a wild mixture of C_2H_4 polymers of preponderatingly branched-chain structure. Traces of colloidal Ni accelerate the displacement; long chains cannot form. Suitable combination of growth and displacement gives control of the C_2H_4 polymerization. $Al(C_2H_5)_3$ activated with traces of Ni produces from C_2H_4, at 100°–110° C practically quan C_4H_9-1, which is quite inert towards $Al(C_2H_5)_3$, *i.e.* C_2H_4 dimerizes quite selectively when mixed with other olefins. In C_2H_4 dimerization to C_4H_8, when the C_4H_8 yield falls from >90% to <10% higher C_2H_4-polymers, *e.g.* C_6H_{12}, C_8H_{16}, $C_{10}H_{20}$, etc., are formed instead of C_4H_8, showing that the Ni co-cat is inactivated. Its stability is improved by 0·2% C_2H_2 or acetylene hydrocarbon addition to the C_2H_4. An apparatus based on this is presented for continuous conversion of C_2H_4 to pure α-C_4H_8, an economical commercial proposition. Direct application of the process to the production of higher α-olefins presents difficulties as discussed fully. It is impossible to adjust and maintain conditions const. Growth and displacement must be carried out as separate operations, as described. Statistical and non-statistical course of the polymerization and further applications are discussed. R. T.

CHEMICAL AND PHYSICAL REFINING

807. Low temperature phase equilibria. W. W. Akers *et al.* *Industr. Engng Chem.*, 1954, **46** (12), 2531–6.—Phase compositions for the methane–propane system are given over the range

32° to −176° F and for the CO_2–propane system from 32° to −40° F. B. A. F.

808. Volumetric and phase behaviour of nitrogen–hydrocarbon systems. W. W. Akers *et al.* *Industr. Engng Chem.*, 1954, **46** (12), 2536–40.—Data on the volumetric and phase behaviour of the nitrogen–*n*-heptane system are given over the temp range 90°–360° F and pressures up to 10,000 p.s.i., together with the phase behaviour of the nitrogen–butane system over the range 100°–300° F. B. A. F.

SPECIAL PROCESSES

809. Gas cleansing and purification with ethanolamines. H. Kristensen. *Chim. et Industr.*, 1955, **73**, 69–77.—Description of Girbotol process of gas purification, mainly applicable to CO_2 and H_2S removal. Ethanolamines are used in aq soln (10–30%), mono- for natural gas and high CO_2 contents, di- for high H_2S; triethanolamine is less efficient, and its use is now abandoned. Brief description, with flow sheets, of necessary plant is given. V. B.

810. Crude oil to ethylene. Anon. *Oil Gas J.*, 7.2.55, **53** (40), 114.—The new ethylene cracking plant at the large Montecatini petrochemical plant at Farrara, Italy, is nearing completion. Plant capacity will be 13,200,000 lb of ethylene, 17,600,000 lb of polystyrene, and 12,000,000 lb of acetone/year. The key raw material is ethylene, produced by cracking naphtha and gas oil in an integrated operation starting from crude oil. G. A. C.

811. Large-scale manufacture of "Terylene." Anon. *Petrol. Times*, 4.2.55, **59** (1500), 133.—The ICI plant at Wilton, Yorks, for production of Terylene is described. Paraxylene, one of the 3 main raw materials required, is produced at Stanlow; ethylene glycol, the second requirement, is produced in the Wilton cracking plant; and the third reagent, methanol, is obtained from coal at the ICI's Billingham works. G. A. C.

812. Some recent developments and future prospects in the petroleum chemicals industry. W. H. Reay. *Petrol. Times*, 18.2.55, **59** (1501), 180.—This is the first of a 2-part article, and considers recent developments. Acetylene and its manufacture by the Wulff, Sachsse, and Schoch processes are described, as also is sulphur, the second product with an increasingly important role in chemical synthesis, and which is recovered from waste gases. G. A. C.

813. Petrochemical routes to acetylene manufacture. P. Sherwood. *Chim. et Industr.*, 1955, **73**, 78–84.—Total U.S.A. C_2H_2 production is 220,000 tons/year, of which 97,000 is obtained by hydrocarbon cracking; 70% of C_2H_2 is used for chem synthesis. In all decomp processes for C_2H_2 reaction products have to be rapidly cooled to achieve satisfactory yield. 3 main methods, for which CH_4 is commonest feed, are: (1) partial combustion with O_2 ($O_2/CH_4 = 0{\cdot}6$), yielding also synthesis gas (CO/H_2); (2) thermal cracking, for which best yield is given by C_2H_6; (3) electric discharge through the gas, one plant only of this type, in Germany. All processes yield C_2H_2 at 8–11% concn, gas from (1) requires special purification treatment owing to large concn CO_2. Crude acetylene can be purified by soln under pressure in H_2O; of selective org solvents dimethylformamide is most widely used. V. B.

814. Methane conversion with oxygen. T. Borelli and A. Teatini. *Riv. Combust.*, 1955, **9** (1), 35–45.—After a short survey of the main industrial processes for methane conversion with oxygen, the authors describe the Fauser–Montecatini process. The latter operates in the presence of a cat, and the conversion is carried out in a single reactor, thus attaining high yields and low operating costs. The plants erected so far in Italy by Montecatini are also described. (Authors' summary.)

815. The alkylation process. R. Stiles. *Petrol. Refin.*, 1955, **34** (2), 103–6.—A review of the development of the Cascade Reactor and its design. For high quality alkylate thorough mixing must be obtained and heat of reaction removed by auto-refrigeration. Series flow of recycle and cat and parallel flow of olefin feed create optimum conditions with a minimum flow of re-cycle, thus reducing equipment needs very considerably when compared with jet systems. R. L. R.

816. Hydrofining is a natural for naphthas. D. L. Baeder and C. W. Siegmund. *Oil Gas J.*, 21.2.55, **53** (42), 122.—Advantages given include major product quality improvement, upgrading of poor quality stocks previously considered unattractive for processing, no re-running of finished products, no waste disposal problem, and continuous operation. Graphs and tables are given. G. A. C.

817. Bio-oxidation of plant waste. A. V. Delaporte. *Petrol. Engr*, 1954, **26** (13), C43–5.—Removal of 95% of the phenols and 100% of sulphides has been effected under normal operating conditions. After gravity oil separation, waste passes to the oxidn basin, containing bacterial sludge, through mixing eductors. The continuous overflow passes to a gravity separator, where bacterial sludge settles, the "clear" water passing to nearby river. High oil content is not toxic to the organisms, but temp below 55° F cause difficulties. J. B. S.

METERING AND CONTROL

818. Reduce your instrument maintenance. E. D. Mattix. *Oil Gas J.*, 7.2.55, **53** (40), 96.—Clear, concise drawing and specifications, instruction on important instrument characteristics, use of manometers which do not employ mercury, wear guards on thermocouple wells, gas range or steam tracing to eliminate wear and tear on controllers, and installation of well-equipped pressure-gauge test board are factors in reduction of instrument maintenance. A number of detailed examples is given. G. A. C.

819. Instrumentation and automatic control in oil refineries. Pt II. Measuring instruments. E. H. W. Banner. *Petroleum, Lond.*, 1955, **18** (2), 55–60.—Pneumatic transmission is used between detecting element and indicator or controller and control valve in refinery operation except for temp measurement. This is usually by electrical means depending on thermo-e.m.f.s, but valve actuation is still pneumatic. Pressure measurement is by means of Bourdon tube and bellows and air jet-flapper arrangements. Flow measurement methods are based on pressure differential across an orifice or venturi. Liq level measuring instruments employ a restrained float carried on torque tube. Most of these instruments have sensitivity and integral control time adjustments. J. B. S.

820. Automatic proportioning equipment for bunkering plant Anon. *Petrol. Times*, 18.2.55, **59** (1501), 179.—The operation is described of flow-control installators for the automatic blending of heavy and light fuels, fitted in a number of Norsk Braendselolje (Norway) bunkering stations. G. A. C.

821. Why Humble revamped its air system. R. L. Dockendorft. *Oil Gas J.*, 21.2.55, **53** (42), 137.—The case history is given of the development of the dry instrument air system at Humble's Bayton refinery. Special features include feeder stations, transmissions, and supplements. G. A. C.

PRODUCTS

CHEMISTRY AND PHYSICS

822. Liquid–liquid extraction in theory and practice. H. R. C. Pratt. *Industr. Chem. Mfr*, 1954, **30**, 597–601 (*cf.* Abs. **400**, 1955).—An extractor selection chart is presented, taking into account 28 types of contactor and 19 possible design requirements. Points are allocated to each contactor against each design requirement as follows: 0, unsuitable; 1, of doubtful value, but can be used subject to experimental confirmation; 2, fairly good; 3, good; 5, outstanding. Design requirements are elaborated, and one example is given illustrating use of selection chart. 69 refs. A. C.

823. Liquid fuels: contributions of fundamental research to the study of the combustion of pulverized jets. M. W. Thring. *Bull. Ass. franç. Tech. Pétrole*, 1955, (109), 17–36.—2 cases are taken, combustion chamber of gas turbine and flame of Martin oven. Combustion chamber design depends on factors governing combustion time of droplets, mixing time, and flow pattern in the chamber. Primary factor governing combustion time is droplet size, determination of this considered, followed by discussion of inflammation delay, combustion time of individual droplets, mixing time, and flame radiation. Concluded that droplets of mean size 50 μ can be easily obtained by steam, air, or mechanical pulverization, but 10 μ is very difficult to attain. For 50-μ droplets combustion time depends on evap rate, and is of order of $5–10 \cdot 10^{-3}$ sec. In Martin oven it is desirable to have high factor of total emission, provided that this not accompanied by flame lengthening, this is attained by using fuel of high C–H ratio. Limiting factor of combustion intensity in gas turbine is still obscure, it appears to be governed either by combustion time of the droplets or by mixing considerations; if the former applies air pulverization or pre-vaporization of the fuel appear to present interest for future developments. V. B.

824. Instantaneous measurement of luminous flame temperature. G. Monnot. *Rev. Inst. franç. Pétrole*, 1954, **9**, 587–613, 740–63.—Emission of diffusion flames and effect of soot particles thereon; detailed description of monochromatic photo-electric pyrometer and results obtained therewith on flames from the Ijmuiden experimental furnace, conclusions are drawn concerning the effect of variables such as fuel flow, nature and amount of atomizing fluid; 2 colour (red–green) pyrometer and its application to diesel engines, thermal equilibrium obtains only when air–fuel ratio is close to stoichiometric, under which conditions exhaust smoke is dense. Initial combustion temp of fuel (*ca* 2000° K) is independent of variables such as mixture strength, supercharge pressure, and injection advance. In thermal exchanges between gas and combustion chamber walls radiation plays only a minor part. V. B.

825. Applied chemical kinetics. X. Liquid phase reactions. J. C. Jungers and F. Coussemant. *Rev. Inst. franç. Pétrole*, 1954, **9**, 707–39 (*cf.* Abs., **578**, 1955).—Further instalment, concerned with complex reactions and their catalysis by acids and bases. V. B.

826. Recent studies of metallic friction. F. P. Bowden. *Engineer, Lond.*, 1954, **198**, 886–9, 902–5.—A review of existing scientific knowledge about friction, including the following studies: metallic transfer in engineering operations, with possible consequences in service of machined parts; surface temp measurement methods for sliding solids; coeff of friction of some non-metals, especially poly-tetra-fluorethylene; ignition of firedamp in coal-mines by frictional hot spots; sliding friction at very high speeds (up to 2000 m.p.h.) and at very high temp (2000° C); and rolling friction. A. C.

827. Exothermic reaction between carbon and hydrogen at high pressure. F. J. Dent. *Riv. Combust.*, 1954, **8** (9), 611–38.—A report on investigations carried on during several years on the exothermic reaction between carbon and hydrogen under high pressure. Results of experiments vary noticeably with the thermal conditions, as has been observed in bench-scale runs with fixed-bed and fluidized-bed operations. By careful control of rate of heating and final temp the operation is characterized by a high methane yield and a high gasification level. In fixed-bed operations, an uncontrolled temp rise decreases methane formation. Hydrogenation can be considered as a particularly efficient method in the carbonization of coal. The technique of fluidized bed allows to control the final temp, not the rate at which the same is reached.
(Author's abstract.)

828. Thermal behaviour and auto-ignition temperature of powdered cork. D. Costa, P. Batti, and E. Susa. *Riv. Combust.*, 1954, **8** (6), 429–37.—The study of thermal behaviour and of auto-ignition temp of organic powders has been extended to cork. Thermal differential analysis up to 550° C failed to show, for this substance, thermal peaks of any kind up to the temp of combustion. Combustion starts rather slowly at *ca* 200° C, and culminates at 400° C with a noticeable exothermic effect. Auto-ignition temp, determined by the apparatus described, on powder of different sizes, ranging from 89 to 235 μ, increases with decreased powder size. The behaviour of cork is analogous to that of other organic powders previously examined. Auto-ignition temp of cork powder, which is, for the size of powder and for the concn of air studied, included from 400° to 500° C, corresponds with sufficient approximation to the temp of methane and hydrogen release from cork in conditions of thermal decomposition.
(Authors' abstract.)

829. Oxidation of *iso*propanol by oxygen-containing gaseous mixtures. M. Baccaredda and C. Pedrazzini. *Riv. Combust.*, 1954, **8** (6), 417–28.—The oxidn of *iso*propanol by oxygen containing gaseous mixtures has been investigated. The reaction has been carried out in a pyrex tube, at different space velocity, and at different vol ratio of *iso*propanol to oxygen at temp of 380°–440° C. Between certain limits of space velocity, mixture composition, and temp, oxidn products consist almost exclusively of acetone, hydrogen peroxide, and water. While yields of alcohol transformation increase by decreasing space velocity and increasing temp, yields of hydrogen peroxide reach a max for a determined oxygen–*iso*propanol ratio. From the standpoint of max hydrogen peroxide production, the best results have been obtained by using air as oxidizing agent, in vol equal to alcohol vapours at 400° C and throughput values of 200–280 l/h/l of reactor space. In these conditions acetone yield of 13% per single pass has been obtained and hydrogen peroxide yield of 75% mol based on acetone produced. At slightly higher temp (425°–440° C) acetone yields are 20–25%, with slightly lower hydrogen peroxide yields. The presence of diluent gases in air decreases the hydrogen peroxide yield. The presence of various hydrogen peroxide stabilizers and of ozone lowers hydrogen peroxide yields, ozone favours the conversion of alcohol to ketone. Economical convenience of a commercial application of the process studied to the simultaneous production of acetone and hydrogen peroxide is discussed.
(Authors' abstract.)

830. Advances in separation of hydrocarbons and related compounds. Various. *Industr. Engng Chem.*, 1955, **47** (2), 192–257.—Of the 11 papers presented in the symposium 6 deal with separations based on the chemical structure of the hydrocarbon constituents. A liq phase adsorption study deals with equilibria and rate processes involved in the Arosorb process. The formation of stable and easily handled complexes of urea with straight-chain hydrocarbons and thiourea with branched-chain or *cyclo*-aliphatic compounds enables otherwise difficult or impossible separations to be performed. In the field of solvent extraction, oxy- and thio-dipropionitrile as selective solvents in the C_5–C_{10} range is described and liq SO_2 as a means of reducing sulphur and aromatic content of

stocks has been greatly improved by the use of $AlCl_3$, SO_2, and BF_3 as promoters. The low cost of liq CO_2 and its unusual miscibility relations with hydrocarbons has led to a study of its possible application in solvent extraction processes. Its performance with 132 co-solvents has been evaluated. The separation of *p*-xylene from *o*- and *m*-xylenes is possible by means of the formation of an equimolal complex with CCl_4 and recovery of up to 90% of the *p*-xylene from cat reformer stocks by this method is recorded. Separation of organic liq in open, packed, and rotary thermal diffusion columns is treated in 2 papers, and high efficiencies with the packed annulus type are reported. A third paper discusses the properties of lub oil fractions produced by thermal diffusion. The symposium concludes with a review of recent developments in dist, including advances in complex vapour–liq equilibria, plate efficiency prediction, types of vapour–liq contactors, and new techniques in azeotropic and extractive dist. B. A. F.

831. Vapour liquid equilibria in binary systems. R. B. Williams and D. L. Katz. *Industr. Engng Chem.*, 1954, **46** (12), 2512–20.—Experimental data are given for the binary systems of hydrogen with ethylene, ethane, propylene, and propane at temp from −300° to 75° F and pressures from 250 to 8000 p.s.i. B. A. F.

ANALYSIS AND TESTING

832. Application of statistical analysis to the evaluation of crude oils. M. Killer. *Nafta (Yugoslavia)*, 1954, **5** (11), 310–15.—Analyses of 35 crudes from different wells of the Sumecani field served as a basis for a statistical evaluation of crude characteristics. Standard deviations, variation coeff, type values, and correlation coeff were calculated. The characteristics of a representative sample of the crude were in good agreement with the type values found, showing homogeneity of the oilfield. The strongest functional relation was found to exist between visc and % dist at 300° C, and between visc and density of the crudes. (Author's abstract.)

833. Carbon dioxide absorption by sealing liquids as a source of error in gas analysis. H. W. Thoenes. *BrennstChemie*, 1954, **35** (23–24), 374–7.—Reading accuracy of the testing instrument, CO_2 cont of sample, and contact time of gas with sealing liq are deciding factors for errors occurring through absorption. If these factors are suitably adapted, the error through CO_2 absorption in the sealing liq can be kept within the limits of the reading accuracy of the testing instrument. Practical experience collected in an investigation is presented in tables and charts for a series of materials. R. T.

834. Molecular spectroscopic analysis of unbranched and branched hydrocarbon chains. II. Intensity of Raman lines of paraffins. H. Luther and E. Lorengel. *BrennstChemie*, 1954, **35** (21–22), 338–44.—Spectroscopy presents a useful addition to conventional methods for analysis of petroleum and petroleum products. Intensities of the most important Raman lines of the *n*-paraffins from C_6H_{14} to $C_{16}H_{34}$ and of some simple branched paraffins are newly determined under definite conditions as a contribution to a useful method for hydrocarbon analysis. Comparisons show that the C–H-frequencies have a clearer intensity pattern than the C–C-frequencies. In the *n*-paraffin spectra all the lines examined, excepting line 1450 cm^{-1} between C_9 and C_{11} show an intensity transition, especially marked in the C–C-frequencies. Regularities in the displacement of the CH_2-group in the chain are recognizable in the spectra of the *iso*-paraffins, which, however, must be supported by further material. The molar scatter coeff of the C–H-frequencies can be calc approx from the group increments. For CH_2-groups for *n*- and *iso*-paraffins a common formula applies. For the single material analysis with the help of the Raman spectrum, prediction spectra relative to the intensities can be derived by inter- and extrapolation of the values found. For group analysis of paraffin mixtures with the help of the Raman spectrum no procedure surpasses that of Luther and Berge. R. T.

835. Determination of aromatic hydrocarbons by fluorometric methods. F. Gasparotti and R. Baistrocchi. *Riv. Combust.*, 1954, **8** (6), 438–46.—The application of fluorometric methods to the determination of aromatic hydrocarbons in gasolines having a middle b.p. between 100° and 110° C has been studied. 10 samples of different gasolines have been examined by a fluorometric technique. Percentage of aromatics is calculated comparing intensity of fluorescence of the sample with fluorescence intensity of the same, additioned with known quantities of a given aromatic hydrocarbon. Results obtained are compared with those from conventional method (ASTM D-875-461), and the reasonably good agreement between the results indicates that the fluorometric method proposed can be used for routine analysis. (Authors' abstract.)

836. Volumetric behaviour of *n*-hexane in liquid phase. D. E. Stewart *et al. Industr. Engng Chem.*, 1954, **46** (12), 2529–31.—The specific vol of *n*-hexane was measured at pressures up to 10,000 p.s.i. at temp between 100° and 460° F. Data agree with other measurements reported. B. A. F.

837. A rapid method for the determination of non-hydrocarbon gases in commercial liquid fuel gas. A. E. Heron. *J. Inst. Petrol.*, Feb. 1955, **41** (374), 63.—The paper presents a method for the determination of non-hydrocarbon gases in bottled liq fuel gas and similar gases, in which the residual gas is measured after absorption of the hydrocarbons in glacial acetic acid. Both saturated and unsaturated hydrocarbons are rapidly dissolved, and virtually complete absorption of the hydrocarbons can be achieved. Analysis of the residual gas has shown that it consists almost entirely of a mixture of oxygen and nitrogen. A modified Orsat-type apparatus and the technique for carrying out the analysis are described. U. M.

838. Ion exchange symposium. Various. *Industr. Engng Chem.*, 1955, **47** (1), 46–101.—The 11 papers presented include the use of ion exchange membranes in electrolytic cells and the use of ion exchange resins for removal of phenol, chromic acid, and sulphuric acid from waste waters. The capacity and leakage of exchange columns is also dealt with. B. A. F.

839. Sampling and testing gaseous fuels. Anon. *Petrol. Times*, 4.2.55, **59** (1500), 133.—The recent edition of "ASTM Standards on Gaseous Fuels," Feb. 1954, is reviewed, and errors, inconsistencies, and a certain lack of standardization of format indicated.

Subjects dealt with in this edition include sampling and measurement, analysis, sulphur content, cal. val., sp. gr., moisture content, and v.p. of LPG. G. A. C.

840. The testing of "L.P.G." and similar hydrocarbon gases—some notes on procedures currently used in the U.K. Petroleum Gases Panel of Institute of Petroleum. *J. Inst. Petrol.*, Feb. 1955, **41** (374), 54.—General specification requirements for commercial butane and propane in the U.K. are given, together with comments on the test procedures usually used. These include low-temp dist analysis and conventional methods for determination of total sulphur, hydrogen sulphide, and mercaptans. Moisture content is usually determined, when required, by means of Fischer reagent. An historical survey is given of the work of the Petroleum Gases Panel in connexion with vapour pressure of LPG. 13 literature refs included. U. M.

841. Thermal differential analysis applied to solid paraffin waxes. G. Costantinides and S. Valussi. *Riv. Combust.*, 1954, **8** (7–8), 526–44.—The behaviour of solid paraffin waxes of petroleum origin toward the thermal differential analysis has been investigated, and the results have been correlated to wax composition. Urea adducts formation and thermal differential analysis have been associated to this aim. Lower mol. wt. waxes, show, at the solid state, 2 transition points, while heavier waxes show one single transition point. The magnitude of the phenomenon is influenced by rate of cooling

of the sample. *iso*Paraffinic waxes, similarly to the normal paraffinic, present transition phenomena at the solid state. (Authors' abstract.)

842. Thermal differential analysis of solid paraffin waxes from vacuum residues. C. Costantinides and S. Valussi. *Riv. Combust.*, 1954, **8** (7–8), 545–50.—Thermal differential analysis has been extended to the study of solid paraffin waxes from vacuum residues. Normal paraffins as well as mixtures of *iso-* and *cyclo*paraffins, show transition points in the solid state. The magnitude of the phenomenon is influenced by rate of cooling of the sample. The existence of transition points for *iso-* and *cyclo*paraffins, observed by the authors, had not been noticed before. (Authors' abstract.)

843. Stability of shale-oil gasoline. C. B. Miller, Jr. *Petrol. Refin.*, 1955, **34** (2), 124–6.—An investigation on a particular stock by means of lab accelerated oxidn tests and mildly accelerated storage tests have indicated that the uninhibited cracked gasoline is very unstable but is responsive to the same additives used to stabilize ordinary cracked gasoline. The storage stability problems seem to be also similar to those of cracked gasoline stocks derived from petroleum. R. L. R.

GAS

844. Gas industry looks to continued growth. N. S. Morrisey. *Oil Gas J.*, 31.1.55, **53** (39), 162.—Marketed production of natural gas and estimated proved recoverable reserves in the U.S.A. are tabulated, state by state. It is predicted that the expansion of the natural gas industry will continue during 1955. G. A. C.

845. Hydrogen cyanide from natural gas. U. Maffezzoni. *Riv. Combust.*, 1954, **8** (11), 795–803.—2 processes for hydrogen cyanide manufacturing from natural gas are reviewed and discussed. The most interesting direct applications of hydrogen cyanide and its employment in inorganic as well as organic syntheses are examined. Particular attention is given to the production from ethylene and hydrogen cyanide of acrylonitrile and to its applications. Statistical data are given on U.S. production of the above-mentioned chemicals and a forecast of the future Italian production of hydrogen cyanide. (Author's summary.)

846. Report on the adaptation of natural gas for domestic appliances. C. Padovani and E. Gatti. *Riv. Combust.*, 1954, **8** (10), 701–11.—Report on the work carried out on domestic appliances in Brescia, in order that natural gas might be used instead of coal gas. The following combustion characteristics have been investigated: flame stability; carbon monoxide content of flue gases; and thermal flow. Modifications of the burners, enclosed reduction of nozzle section, widening of the section of ports, and other modifications of less importance, according to the type of burner. As most of the appliances did not have any air regulation, and as the distribution pressure did not rise above 100 mm water column, the modifications involved substantial decrease in thermal output. Pushing the thermal output would have carried to increase the carbon monoxide content of flue gases above the safety limit. Other experiments have been carried out in order to establish conditions to be adopted during a transition time, in which, by applying to all the appliances to be transformed a nozzle of dimensions intermediate between the original and the final ones, and by distributing 2 gases of successively higher calorific value, the transformation of the entire system could be carried out without sectioning the distribution network. (Authors' summary.)

847. Natural gas dehydration. G. Traina. *Riv. Combust.*, 1954, **8** (11), 785–94.—After a short outline of the necessity of natural gas dehydration and of the several procedures recommended, the characteristics of more important commercial-olid adsorbents are described. Particular reference is made to characteristics and adsorption efficiency in static and dynamic conditions, of a silica gel (M) developed at the Guido Donegani Research Centre of the Montecatini Co. Results obtained in a commercial unit for natural gas dehydration, using the M silica gel, are reported. (Authors' summary.)

848. Pledger plant recovers all except odour. A. L. Foster. *Petrol. Engr*, 1954, **26** (13), C36–42.—Plant recovers fuel oil, kerosine, gasoline, *iso*butane, and LPG from gas from Pledger field. The gas enters the plant at 2000 p.s.i.g. and after expanding and cooling, when some liq hydrocarbons separate, lean oil absorbers removed propane and heavier. Products are recovered from the rich oil by successive flashing and dist, with high pressure re-absorption to recover gasoline. J. B. S.

ENGINE FUELS

849. Some fuel injection problems. W. P. Mansfield. *Trans. Inst. Mar. Engrs*, 1954, **66** (12), 309.—The paper deals with certain fuel injection problems which have engaged the attention of the British Internal Combustion Engine Research Association, and describes the manner in which some of these problems have been solved.

A study of secondary injection led to the introduction of a form of pump delivery valve which, by acting as a dash pot, eliminates this troublesome effect.

From time to time cases occur of external corrosion of fuel injection nozzles. A particularly serious case, in which such corrosion rapidly led to failure of several engines, was investigated. Combustion studies in progress in the lab indicated that the corrosion might be due to overcooling of the nozzles, and this was proved by tests to which similar corrosion was produced artificially. Other types of nozzle attack are also discussed.

In the course of work on the turbo-charging of engines, difficulties arose at high rates of injection as a result of the heavy impulsive loading of the mechanical drive of the injection system in use. These were overcome by the adoption of a new hydro-pneumatic driving system, the construction, characteristics, and advantages of which are described. The system is considered to be very suitable for large engines. T. T.

850. Alcohol with normal diesel fuels. H. A. Havemann, M. R. K. Rao, A. Natarajan, and T. L. Narasimhan. *Gas Oil Pwr*, 1955, **50**, 15–19, 45–50.—The aim of this work was to: (*a*) use as fuel greater proportions of alcohol in engines of high C.R. than is now accepted practice; (*b*) use heavy fuel in high-speed diesels. In a review of previous work it was noted that: (1) heavy fuel requires addition of combustion accelerators in high-speed engines, but these additives are not at present economic—combustion accelerators also reduce carbon deposit and wear; (2) 'carburation of volatile fuels of high S.I.T. improves the power output; (3) to some extent blends of gasoline or alcohol with diesel fuel give improved performance.

Experiments were carried out with fuel blends and with the components fed separately to the engine. It was found that blends of alcohol with B.S.S. grade A fuel were not homogeneous at room temp but homogeneous at 60° C; blends with grade B fuel were not entirely homogeneous at 60° C; and with boiler fuel there was no miscibility. In all cases traces of water added to the clear soln gave separation of phases. Engine tests carried out on blends containing 5 or 10% alcohol showed no noticeable improvement in combustion and running properties.

In the experiments with the fuels added separately a Ricardo research engine of C.R. 21 : 1 with diesel fuel injected into a pre-combustion chamber was supplied with alcohol from the induction manifold via a variable jet carburettor. The engine was first run on diesel fuel only, then the alcohol was added as the amount of oil was reduced. It was found that: (1) the max possible amount of alcohol was 36% of the total fuel, equivalent to 54 : 1 air : alcohol; (2) the engine could be overloaded by 16%; (3) except at light loads the thermal efficiency increased as the proportion of alcohol was increased;

(4) when alcohol was inducted the smoke density and exhaust temp were both lowered.

In a similar experiment with a Petter AV1 series II engine of C.R. 16½ : 1 developing 5 b.h.p. at 1500 r.p.m. the fuel and alcohol were again added separately. It was found that: (1) under full load the max amount of alcohol which could be used without the engine missing or hinting was 70% with grade A fuel and 60% with grade B or boiler fuel; (2) " passable " smoke density (*ca* 45%) was reached with only ½ load with boiler fuel; addition of alcohol enabled 40% overload to be attained with the same smoke density; addition of alcohol markedly reduced the smoke density with all fuels; (3) up to full load addition of alcohol reduced thermal efficiency, with overload it was increased; (4) volumetric efficiency was slightly improved; (5) addition of alcohol slightly increased the exhaust temp with fuels A and B, with boiler fuel it was reduced at high loadings; (6) up to 30% water could be mixed with the alcohol supplied with grade B fuel without deleterious running effects.

The results obtained with the Ricardo and Petter engines are compared and discussed. It is concluded that alcohol can be used as a booster fuel, and water in the alcohol does not upset the engine's performance. In high-speed diesel engines it promises to be a cheaper and better method than supercharging. Induction of alcohol gives a cleaner exhaust, and under overload conditions higher air utilization is obtained.

H. C. E.

851. Wear in marine diesel engines. J. Grindod. *Petrol. Times*, 18.2.55, **59** (1501), 190.—Diesel oils with high cetane numbers, aided by the electrical phenomena set up, contribute to corrosion in ships' engines, causing exceptional wear in pistons and cyl and resulting in deterioration of lub oils in service. A theory has been built up to explain the action, which is very pronounced in low-speed 2-strokes. The presence of peroxides and aldehydes, with subsequent detonations, are said to be the causes of the troubles. Installation of a compensating aggregate controls harmful voltages.

G. A. C.

852. Experiments with a small gas turbine using gaseous fuel. Anon. *Oil Eng.*, Feb. 1955, **22** (260), 390.—Development work carried out at Rover on the adaptation of the 60-b.p.h. industrial unit to burn gaseous fuels. Account given of the fuel equipment—accelerator, governor, and burner—and also of 2 valves. Refinery, sewage, natural, and coal gases may be used, calorific values of at least 200 C.H.U/cu. ft. are required. A compressor is needed to boost fuel pressure to the required 35 p.s.i. for engine running. The engine will develop the same power on coal gas, at a lower temp, that it will on liq fuel. 4 photographs, 3 diagrams.

C. B.

LUBRICANTS

853. All-season high performance oil. J. C. Cree and J. G. Withers. *Auto. Engr*, 1955, **45** (1), 21.—The properties of a new all-season motor oil are given, and their effect on fuel consumption, oil consumption, starting, engine wear, and cleanliness is discussed. It is claimed that considerable savings in operational costs are achieved. 10 refs.

T. T.

854. New motor oil trends in the U.S.A. J. Groff, R. Fourtel, and A. Schilling. *Bull. Ass. franç. Tech. Pétrole*, 1955, (109), 37–46.—Adverse effect of bt. stock component in motor oils is shown by Octane Requirement Increase (test procedure given). Visc characteristics of multigrade oils are discussed and depicted graphically. These oils may increase tappet and rocker wear, especially if detergent additives are incorporated, addition of Zn dithiophosphate reduces this wear, inlet valve fouling is another possible disadvantage of multigrade oils. Details are given of LS 5 and 6 test procedures for tappet, cam, and rocker wear.

V. B.

855. Importance of viscosity behaviour of lubricants for machine operation and building. G. Vogelpohl. *Brennst-Chemie*, 1954, **35** (23–24), 363–8.—Visc is not a decisive factor for friction-lowering properties, and no testing machine exists for determining suitability of the lub. Methods for measuring visc are examined critically. With the help of the calculating method presented in this work it is possible to design bearings to work safely. In cases of specially accurate design bearings can be lubricated with air. Correctly-designed bearings with pure liq friction can bear such great loads that the shaft material becomes fatigued and the shaft breaks through alternating bending stress. Precondition for every bearing calculation is knowledge of visc–temp behaviour of the lub, which dare not be withheld from the constructor and manager.

R. T.

856. Grease and lubricants plant. Anon. *Engineer, Lond.*, 1955, **199**, 169–71.—New grease plant and lub oil blending facilities of Vacuum Oil Co, at Birkenhead, commenced operations in June 1954, replacing temporary plant employed since destruction of main plant by enemy action in 1941. 250 grades of grease are made, system incorporates rapid (20 minutes) saponification of fatty component by means of high-speed Stratco contactors before final mixing of grease in steam- or oil-heated kettles. Basic mineral oils for grease and blended lub supplied mainly from V.O.C.'s Coryton refinery by coastal tanker. *Ca* 100 main lub blends produced, total output of works 1500–2000 tons/week. Photographs and diagrams given.

A. C.

857. New grease plant for Vacuum Oil. Anon. *Fluid Handl.*, Feb. 1955, **61**, 32–7.—A new grease plant has been built at Birkenhead to replace one destroyed in 1941 by enemy action. This plant is claimed to be one of the largest in Europe. Production, which started in June 1954, has reached 1500–2000 tons/week. Good road and rail service ensure low transport costs.

The plant, which can cater for a 50% increase over present output, is housed in a steel-framed, brick-panelled building set on 17-inch pressure-type concrete piles.

The grease-making process employs the contactor method of soap making, which ensures a high degree of saponification. The chief manufacturing vessels are 4 contactor heaters and 8 kettles, fully instrumented. The unit was handed over to the company ready for operation by the contractors in June 1954.

D. J. S.

BITUMEN, ASPHALT, AND TAR

858. The use of asphaltic bitumen in dike construction. L. W. Nijboer. *Ingenieur, 's Grav.*, 24.12.54, **66** (52), B191–9.—An analysis is given of asphaltic bitumen properties of importance for hydraulic constructions. The heat and oxidn stability and the resistance to water and plant growth are discussed for bitumen and aggregate mixtures. The rheological and mechanical properties of pure bitumen are discussed and the influence of temp considered. The deformability and breaking strength of aggregate mixtures and the phenomenon of their fatigue fracture is dealt with and illustrated with graphs. The properties of bituminous materials for dike revetments are analysed, as well as the stresses and deformations of such revetments under wave impact. A tentative method of calculation is developed and satisfactorily correlated with data obtained during the Feb. 1953 storms. 7 graphs, 4 tables.

G. F. T. C.

859. Application of bituminous revetments in dike construction on Goeree-Overflakkee. G. Terluin. *Ingenieur, 's Grav.*, 24.12.54, **66** (52), B187.—A detailed description is given of the construction of sea-wall defences after the Feb. 1953 floods. 7 figs and photographs.

G. F. T. C.

SPECIAL HYDROCARBON PRODUCTS

860. Gastro-intestinal cancer and the use of liquid paraffin. J. T. Boyd and R. Doll. *Brit. J. Cancer*, 1954, **8**, 231–7.—Statistical examination of purgative histories in 1927 cases

(614 with gastro-intestinal cancer, 1313 non-gastro-intestinal controls), and analysis of usage thereby of 14 purgatives. Some evidence that there is a significant excess of liq paraffin medication among patients with gastro-intestinal cancer; possibility cannot be excluded that it may be a weak carcinogen or co-carcinogen, but it is unlikely that liq paraffin could be an important cause of cancer of stomach or large bowel.
V. B.

DERIVED CHEMICAL PRODUCTS

861. Pure aromatics from cracked naphthas. H. S. Bloch and R. S. Wackher. *Petrol. Refin.*, 1955, **34** (2), 145–9.—The direct extraction of highly unsaturated cracked naphthas by the Udex Process (aq diethylene glycol liq–liq extraction), followed by a clay treatment, yields nitration-grade quality aromatics if the feed is low in dienes and alkenyl aromatics. If the feed has high diene or alkenyl content, selective prehydrogenation is necessary for nitration quality aromatics. Results on 6 feed stocks are given and discussed in detail.
R. L. R.

862. Aldehydes from petroleum. P. W. Sherwood. *Petrol. Refin.*, 1955, **34** (2), 129–35.—A discussion of some of the petrochemical routes for the production of aliphatic aldehydes. (Cf. Abs. **715**, 1955.) Amongst the methods covered are the OXO process—reaction of carbon monoxide and hydrogen (synthesis gas) with olefin to yield aldehyde containing one more carbon atom; Aldolization—most important application of which is the production of crotonaldehyde by condensation of acetaldehyde, and Aldol conversion.

Production of acrolein by condensation and partial oxidn of hydrocarbons is also discussed in detail. R. L. R.

863. Synthetic detergents from petroleum sources. P. W. Sherwood. *Petroleum, Lond.*, 1955, **18** (1), 10–11.—Increasing demand for synthetic detergents has led to a boom in the production of alkyl aryl sulphonates, 56% being derived from petroleum sources as far back as 1950.

A straight-chain kerosine fraction is used as the alkylating agent. This is chlorinated and condensed with benzene in the presence of anhydrous $AlCl_3$. The C_{12}-benzene fraction is separated by dist from high boiling materials. It is then converted to dodecyl benzene using sulphuric or hydrofluric acid. The dodecyl benzene is then sulphonated with oleum and neutralized with caustic to give the alkyl aryl sulphonate, in this case sodium salt of dodecyl benzene sulphonic acid. Concn of active ingredient is 25–85%, remainder being sodium sulphate. J. B. S.

864. Technique and economics of coal chemistry. H. Nedelmann. *Riv. Combust.*, 1954, **8** (12), 865–81.—The main processes of coal chemistry are coking, dist, gasification, hydrogenation, and synthesis. Coking is at present the most important. Pure compounds obtained by coal tar and benzene are raw materials for dyes, pharmaceutical products, synthetic resins, and, more recently, for synthetic fibres. The gas obtained from coking of coal is the main source for long-distance gas distribution in Germany. In the German economy of coal utilization, the low temp dist is less important than coking. However, the dist plays an important role in the utilization of brown coals of Central Germany. Synthesis and hydrogenation processes, after the war, have lost much of their interest, owing to the rise in coal price and the development of petroleum production. Hydrogenation plants have been successfully converted to crude oil refining. Coal chemistry is a necessary and economic complement of mining industry, and its development deserves adequate attention.
(Author's summary.)

865. Syndet manufacture from petrochemicals. F. D. and C. T. Snell. *Petrol. Engr*, 1954, **26** (13), C7–10.—The use of petroleum-based synthetic detergents has increased over last 15 years to 80% of organic surface detergents used. Of these 80% are anionic detergents of alkyl aryl sulphonate type. Typical is dodecyl benzene sulphonate prepared by reacting benzene with an alkylating agent prepared by the chlorination of a kerosine fraction. After sulphonation, the product is obtained by neutralization with caustic soda. Non-ionic detergents, usually liq, are of the polyhydric ester or diethanolamine type. J. B. S.

866. The importance of ethylbenzene and *iso*propylbenzene in the petrochemical industry. P. W. Sherwood. *Riv. Combust.*, 1954, **8** (3), 194–208.—Ethyl- and *iso*propyl benzene are at the moment among the most commercially important aromatic hydrocarbons. Ethylbenzene is particularly used for styrene production, carried out on a commercial scale by 2 processes. The more important of these involves the direct dehydrogenation, an indirect method is carried out by a series of reactions (oxidn, hydrogenation, and dehydration) and yields acetophenone and phenyl-methyl-carbinol as intermediates. *iso*-Propylbenzene, used during world war I as a component of aviation gasoline is now a raw material for phenol synthesis and for the manufacture of α-methylstyrene, a useful monomer for commercial copolymerizations. Both hydrocarbons are derived largely from petroleum stocks. (Author's abstract.)

867. Preparation of dodecylbenzene from benzene and an olefin polymer of C_4 refinery gas. R. Baldacci. *Riv. Combust.*, 1954, **8** (10), 712–19.—Technical grade dodecylbenzene from benzene and an olefin polymer of C_4 refinery gas has been prepared. Owing to the branching of alkyl chain, the polymer will contain from 16 to 20 carbon atoms in the mol, in order to have *ca* 12 carbon atoms in the main chain. Some surface-active properties of the sulphonated derivative of the alkylbenzene prepared from C_4 olefin polymer have been compared with those of a commercial dodecylbenzene from propylene tetramer. (Author's summary.)

868. Dodecylbenzene from petroleum hydrocarbons boiling between 200° and 250° C. R. Baldacci. *Riv. Combust.*, 1954, **8** (10), 720–5.—Alkyl chains from petroleum hydrocarbons boiling between 200° and 250° C have been employed to prepare technical grade dodecylbenzene. The influence of length of the side chain, of the presence of aromatic hydrocarbons, and of alkylbenzene fractionation on the behaviour of the dodecylbenzene sulphonate have been investigated.
(Author's summary.)

COAL, SHALE, AND PEAT

869. Recent infra-red and X-ray studies of coal. J. K. Brown and P. B. Hirsch. *Nature, Lond.*, 1955, **175**, 229–33.—Approx 75% of the carbon in coal is in the form of condensed aromatic ring units, each comprising 4 or 5 rings. The remainder of the carbon, and other atoms, are in a disordered state, assumed to be chemical groupings attached to the aromatic rings, which are highly substituted.

For coals containing >89% carbon the no. of rings per aromatic unit rises rapidly from 5 to *ca* 30 for 94% carbon coal. As the carbon content of coal rises the concn of OH groups decreases, the proportion of aromatic H increases, whilst that of aliphatic H decreases, and the proportion of aromatic carbon increases.

The aromatic units are packed in parallel layers in small groups with no orientation about an axis normal to their plane. With increasing carbon content the order improves, but even at 89% carbon about half of the layers occur singly. The layers have a small orientation parallel to the bedding plane. There is a distribution of pore dia ranging from low values up to *ca* 5000 Å.

With increasing carbon content (up to 89%) there is a gradual improvement in the mol packing; a "liquid-like" structure is formed and the larger pores disappear. Between 89 and 93% carbon the aromatic layers increase in dia, the "liquid-like" structure disappears, and the pores are produced again. H. C. E.

870. Neutral constituents of coal tar from low temperature carbonization, *e.g.* in light oil of 134°–188° C boiling range. A. Jäger and G. Kattwinkel. *BrennstChemie*, 1954, **35** (23–

24), 353–62.—A detailed report is presented on the examination of tar fractions from low-temp carbonization of "Velsen" coal, prepared by dist. Decomp by chem methods and chromatography is supported by infra-red analysis for material identification. The examination extends to 34 materials, detected in the neutral oil fraction b.p. 134°–188° C, *i.e.* 20 aromatics, 4 *n*-paraffins, 6 naphthenes, 3 *iso*-paraffins, and 2 : 5-dimethylthiophene among 8 compounds confirmed by infra-red analysis. Abundant tabulations and charts are presented. R. T.

871. Study of the composition solvent extracted products from Sulcis bituminous coal. V. Berti, B. Casu, C. Manci, C. Padovani, and C. Siniramed. *Riv. Combust.*, 1955, **9** (1), 5–34.—The results are reported of research on the composition of products extracted by solvents from Sulcis bituminous coal. Infra-red examination was made both of the coal itself and the crude products extracted (with monoethanolamine and tetrahydrofuran) as of the fractions deriving therefrom is subsequent extraction by solvents or separated by chromatographic methods. Furthermore, some products obtained by extraction in the presence of hydrogen from the coal itself or its extracts were considered. A study of the infra-red absorption bands reveals the presence of some functional group (OH, NH, CO, and aromatic CH) which appears to varying degrees in both the original coal and the various extracted products and their fractions. The products extracted under hydrogenating conditions show on the whole a more simplified structure than those extracted under normal conditions. (Authors' summary.)

CORROSION

872. Corrosion in the petroleum industry. Pt III. F. H. Garner and A. R. Hale. *Petroleum, Lond.*, 1955, **18** (1), 12–14.—Corrosion due to various chemicals used in refinery operation (hydrofluoric acid, aluminium chloride, alkalis, etc.) is discussed and methods of prevention and materials best able to withstand this corrosion are considered.

Solvent refining and its particular corrosion problems when using furfural, phenol, etc., is also discussed. J. B. S.

873. Electrolytic corrosion caused by differential heating. G. Bombara. *Riv. Combust.*, 1954, **8** (5), 329–38.—Electrolytic corrosion is often caused, in practice, by differential heating of a metallic system in contact with an aq soln. Through simple experiments, it is possible to know the rate of e.m.f. involved in such a differentiation. (Author's abstract.)

874. Oil refineries and corrosion by water. Methods of prevention. P. W. Sherwood. *Petroleum, Lond.*, 1955, **18** (2), 51–3.—The degree of attack by water depends on presence and nature of impurities, temp of system, and velocity. Dissolved oxygen and CO_2 leads to corrosion and $CaCO_3$ and $MgCO_3$ liable to cause fouling. Generally, rising temp causes increase in corrosion. Where corrosion is due to oxygen, flow causes increase due to replenishment of oxygen and carrying away of products of corrosion. Control is by cathodic protection, metallic coatings, inhibitors, alternative environment, or metallurgical selection, all of which are discussed. J. B. S.

875. Preventive passivation of internal surfaces of pipelines washed by sea water. G. Bombara. *Riv. Combust.*, 1954, **8** (10), 726–32.—Sea-shore pipelines generally washed by means of sea water, suffer severe electrolytic corrosion, enhanced by the erosive action of corrosion products. A steady internal protection of pipes is unpractical and expensive. The preventive passivation of internal surfaces of pipes offers a simple means of reducing severity of corrosion, although it is only a temporary protective. (Author's summary.)

876. Protect steel tanks from corrosion. H. J. Keeling. *Petrol. Refin.*, 1955, **34** (2), 140–2.—The corrosion of steel storage tanks by brackish and basic water and sediment can be virtually eliminated by cathodic protection. Power can be obtained from rectifiers, motor generator, or galvanic anodes, depending on nature and amount of exposed metal. Selection of the anode is discussed in detail with a view to eliminating replacement costs, but a satisfactory material has not yet been found. The relative advantages of cathodic protection and internal coating are also studied. R. L. R.

ENGINES AND AUTOMOTIVE EQUIPMENT

877. Italian CFR engine correlation scheme. G. Leidi, C. Padovani, and C. Siniramed. *Riv. Combust.*, 1954, **8** (12), 882–98.—A report is given of the establishment and development of the Italian CFR engine correlation scheme. ASTM motor and research octane No. have been determined in some 20 engines belonging to Italian refiners, research lab, and other institutions under the care of CUNA (Standardization Association in Automotive Engineering). Calculations of the average data obtained are reported, as well as of the typical spread and standard deviation. (Authors' summary.)

878. Free-piston gas turbine. R. P. Ramsey. *Oil Gas J.*, 31.1.55, **53** (39), 275.—In this, the third article on the free-piston gas turbine, thermodynamic characteristics of the machine which are not generally understood are clarified. G. A. C.

879. Gas turbines *v.* reciprocals for pipeline construction. T. R. Rhea. *Oil Gas J.*, 21.2.55, **53** (42), 128.—Comparison data are presented of overall station fuel efficiencies per unit of gas pumped instead of driver efficiencies only, which show that the gas turbine is not at a disadvantage with the conventional engine. The data were taken during cold weather when the turbine is most efficient. G. A. C.

MISCELLANEOUS

880. What's ahead in engineering for 1955? Anon. *Oil Gas J.*, 31.1.55, **53** (39), 170.—Under this general heading is reviewed refinery expansion, petrochemical plants, and natural gas lines for the current year. G. A. C.

881. Refineries rise, pipelines hurdle barriers to serve last large section of U.S. D. H. Stormont. *Oil Gas J.*, 14.2.55, **53** (41), 108.—This is an economic review of the changing fuel supply situation in the Pacific Northwest, where crude oil and products from Canada, the Rocky Mountain area, Middle East, and Venezuela are competing for the market. New refineries pipelines, and other projects are influencing the pattern. G. A. C.

882. The law relating to solvents. M. H. M. Arnold. *J. Oil Col. Chem. Ass.*, 1955, **38** (2), 71.—There is no general law covering solvents. The subject is discussed with respect to the type of law involved, *e.g.* taxation; factory legislation; petroleum legislation, etc.; and common law. 31 literature refs. D. K.

BOOK REVIEWS

Applied Geophysics in the Search for Minerals. 4th Edn. Prof. A. S. Eve and Prof. D. A. Keys. London: Cambridge University Press, 1954. Pp. x + 382. 40*s*.

Nearly 30 years ago the first edition of this book was published, and over the passage of time very little of the original subject matter has been changed, even though these years have been the most formative in the education of the exploration geophysicist. It is to be expected that in this new edition Professor Keys has included most of the modern techniques of applied geophysics, particularly those relating to airborne surveying, but the book fails in the precise fashion of its ancestor: not enough emphasis is placed upon the geological features which control the location of economic wealth and which control, as well, the choice of geophysical exploration method. In the reviewer's opinion, no useful purpose can be served by simply stating the geophysical methods of mineral prospecting, however admirably written these may be, if no attempt is made to indicate the limitations of the various techniques; but this is an indictment of the geophysical literature in general, and cannot be levied against this classical treatise alone. Thus, as an educational text-book this new, revised edition is neither one thing nor another: there are not enough practical examples for the geologist and not enough mathematics for the physicist. How much better it would have been if Dr Keys had left the original book in its former glory—a basic, classical work for all geophysics students—without attempting to produce a modern text-book by a process of resurrection; surely the writing of a brand-new book on the subject, to satisfy the needs of the present-day students, is not for him beyond the realms of possibility?

The additions to and the revisions of the text have given this edition 66 more pages over that of 1938, the additional information being concerned with depth estimations, airborne electrical and magnetic surveys, gravity meters, and seismic reflection techniques for dipping strata. The chapter on radio-active methods has been expanded to give indications of the more modern methods of locating deposits of radio-active ores. A new chapter on well-logging has been added, and an excellent innovation is the introduction of problem papers at the end of each of the main chapters, but, unfortunately, no answers have been provided. A minor source of irritation is the pedantic use of "oersteds" when describing magnetic field intensities, even though the term "gauss" has remained in common practice among geophysicists. The quality of the paper, type-setting, and diagrams are of the high order that one has come to expect from the Cambridge University Press.

Applied geophysics has gone a long way since the day of the divining-rod; it is a pity that the literature has not been able to keep apace of it. D. T. S.

Mass Spectrometry. A. J. B. Robertson. London: Methuen and Co. Pp. 135. 8*s*. 6*d*.

Dr Robertson's book has come at a timely moment. Mass spectrometry is a rapidly growing subject, and it is useful to have a book such as this which summarizes the present position.

A surprising amount of information is packed into 135 pages; indeed, the information is condensed to such an extent that some very careful reading is demanded. Some sections of the book could well have been expanded, particularly that part dealing with the potential energy contours. It is probably inevitable that over-condensation must take place when an attempt is made to condense a wide and difficult subject into so short a monograph, but some shortening of the introductory practical section could have been made with advantage, to allow expansion of the succeeding chapters.

The book is written in an admirably clear style, and can be recommended to all those interested in a subject important both academically and industrially.

One point of criticism which might be made is that the method of giving references only by author and the year is not very satisfactory. In some cases no reference at all is given as to where the relevant data may be obtained, but these are minor blemishes on an otherwise excellent work. R. R. G.

Oil Tanker Cargoes: their safe and efficient handling. John Lamb, O.B.E. London: Charles Griffin & Co. Ltd., 1954. Pp. viii + 208. 18*s*.

As Mr Lamb is head of the Marine Research and Development Department of one of the largest oil tanker fleets in the world and the eminent author of several standard works on marine diesel machinery, it is not surprising that this work is an authoritative and valuable addition to the bookshelves of everyone connected with the sea transport of oil in bulk.

Not an advanced work, encumbered with technical formulæ, it fulfils a real need for those in the industry who have the on-the-spot responsibility for oil tankers and their cargoes. Written primarily for deck and engineer officers of the large number of tankers afloat today, it nevertheless might usefully be studied by allied technical staffs, ship drawing offices, and repair establishments.

The book commences with a brief outline of the history of the sea transport of oil and touches lightly on tanker layout and sub-division. The remarks on p. 23 concerning the cubical capacity of the machinery space are now somewhat modified by a recent Act of Parliament, which became effective from 1 July 1954. This ameliorates the penalties formerly placed upon a relatively small engine room. The various cargo oil pipeline systems are well described, including their fittings and cargo pumping plant.

The elaborate safety precautions which have to be observed, particularly during loading operations, are emphasized and the discharging of cargoes and the handling of a low flash cargo are discussed.

Other chapters deal with such diverse subjects as cargo heating, ventilation of tanks, gas-freeing, and cargo tank cleaning, whilst the important question of ballasting the ship is not forgotten and provides sound advice for the less experienced tanker officer.

The carriage of special cargoes such as creosote and sulphuric acid is to be found described at the latter end of the book, together with bitumen and liquid petroleum gases.

Further sage advice concerning safety precautions in specific cases and some very interesting miscellaneous information concludes. J. A. H.

Acetylenic Compounds in Organic Synthesis. R. A. Raphael. London: Butterworths Scientific Publications, 1955. Pp. xii + 219. 30*s*.

The petroleum industry has become familiar in recent years with the growing importance of acetylene as a versatile raw material in the petrochemical field. The present volume emphasises its even wider potentialities in pure organic chemistry. It is indeed a fascinating picture which the author presents of the broad sweep of modern acetylenic chemistry. After an introductory account of the preparation and general properties of acetylenes, successive chapters deal with their application in the synthesis of the main types of organic molecules, namely, aliphatic, conjugated, carbocyclic, and heterocyclic systems, while a final chapter describes in some detail the practical aspects of the synthesis procedures most often encountered in acetylene chemistry. The numerous literature references (about 700) are mainly to work of the last decade, a fact which emphasises the modernity of this branch of chemistry.

Any chemist wishing to employ these new methods will find the present work, written by one of the foremost researchers in the field, an invaluable guide to the selection of the most successful procedures. J. W. H.

Manufacture and Application of Lubricating Greases. C. J. Boner. New York: Reinhold Publishing Corpn. 1954. Pp. 997. $18.50.

The publication of a new book on lubricating greases will be welcomed by lubrication engineers and petroleum technologists the world over, particularly since this volume constitutes, as far as this reviewer knows, only the second book devoted exclusively to greases. Furthermore, a period of 17 years has elapsed since the last edition of the first one appeared.

During these 17 years, which included the world war II period, there has been so much progress made in the formulation of new greases, development of new processes, and the development of the theory and structure of grease systems that a competent treatise is long overdue. Mr. Boner's book qualifies as well as can be expected in a field where so much of the basic knowledge is still fairly closely held by major industrial companies. It is gratifying, however, to note that the author has devoted some 60 pages to theory and structure even if it has had to be treated in generalized terms. The patent literature still provides the major source of information on these products.

As a reference book this volume of nearly 1000 pages should prove invaluable to all grease technologists. There are excellent chapters on the "new" types of greases, *i.e.* lithium, complex soap, and non-soap thickeners. The conventional types are fully covered and brought up to date. Analysis and testing of greases is also discussed in considerable detail.

Perhaps the greatest progress in making grease manufacture a science has come from the developments in new processing methods and equipment. The description of these modern units and their use in the manufacture and processing of greases is a valuable addition in making Mr. Boner's book a well constructed and comprehensive review of a difficult subject. R. B. K.

Coals and Bitumens and Related Fossil Carbonaceous Substances: Nomenclature and Classification. S. I. Tomkeieff. London: Pergamon Press, 1954. Pp. 122. 17*s.* 6*d.*

This little book, as its full title might lead one to expect, consists for the most part of a compact glossary covering some 1300 items relative to naturally occurring coals and bitumens. It does not include man-processed materials such as coal tar and refinery-produced asphaltic bitumens or carbonate minerals and terms relating to animals and plants. It is intended as a quick reference book for the use or mineralogists, geologists, miners, and technologists. It also includes handy synoptic tables designed to assist the searcher to find the particular names of materials in a group or broad type. Thus "Bitumens," one of 14 divisions, are subdivided into the following 7 groups: "General," "Liquid," "Viscid," "Elastic," "Waxy," "Solid," and "Unclassified."

The word "bitumen" is used in the fundamental generic sense, so that physically it may be gaseous, liquid, or solid, although in view of the modern use of the word in this country it is interesting to note that bitumen is "a very old term originally applied to mineral pitch and later extended to cover all natural hydrocarbons of different degrees of consistency and purity."

As well as the more scientific names, about 250 vernacular terms used by British miners relative to coal and shale are included. These, while of undoubted sociological interest, may be considered by some readers to have a rather limited technical value.

It is pointed out that while bitumens sometimes bear some resemblance to coals, they form a totally distinct class of carbonaceous substances when considered for example from the aspect of generic origin, being formed from highly digested and chemically transformed organic matter subsequently metamorphosed (dynamic and thermo) in the upper part of the earth's crust. Here the author very rightly comments that little known work has been carried out on the classification and genesis of bitumens as a whole. In this connexion it is appropriate to mention here that an international committee was set up for this very purpose following the 3rd World Petroleum Congress at The Hague in 1951, and that progress will be reported at one of the sessions of the 4th Congress at Rome on 10 June 1955.

The terminology relative to the substances under consideration is difficult and frequently highly confusing. The collection for ready reference under one cover of so many of the names given to these closely associated natural substances forms a very real contribution. Authorities will doubtless differ in a number of cases with regard to the understanding of the meaning of the terms, but this should only act as a stimulant towards a clarification of the nomenclature and towards arriving at a more logical and satisfactory scientific classification of "Carbonaceous Substances," or "Organic Minerals" as one school of thought would like to describe them, terms which would automatically have the desired result of excluding carbonate minerals and terms relating to plants and animals. C. F. J.

ADDITIONS TO THE LIBRARY

Guide du Pétrole, 1954–55. O. Lesourd. Paris: Editions O. Lesourd, 1954. (22nd edition). 2 vols. I. Réglementation, pp. xxxvi + 591; II. Annuaire, pp. (lii) + 412 + 134. Frs. 5000.

The previous edition of this work was reviewed last year (*J. Inst. Petrol.*, 1954, 162A). The current edition is published in two volumes in place of one, but otherwise follows closely on the general pattern of its predecessor. Minor changes in contents include the deletion of the brief particulars, previously given, of the major foreign oil companies, and of the glossary. Separate sections are now devoted to French companies producing chemicals from petroleum and national non-petroleum fuels (benzole, alcohol, shale oil); the information concerning these companies having been previously incorporated in the "refining" and "miscellaneous products" sections respectively.

The regulations and other information given appear to have been revised up to mid-1954; among alterations noted are a change (to 75 Research) in the minimum permitted octane rating of regular grade gasoline, and a decrease in the permitted prices of a number of petroleum products.

As for the previous edition, the present one is a "must" for anyone concerned with French petroleum affairs. V. B.

Statistical Summary of the Mineral Industry, 1948–53. Mineral Resources Division, Colonial Geological Surveys. London: H.M.S.O., 1954. Pp. 356. £1 7*s.* 6*d.*

To the petroleum industry the special value of this publication is the 40 pages devoted to statistics on petroleum and allied products, the latter including natural gasoline, natural gas, asphalt rock, natural asphalt, and oil shale. For each of these, production data for the period 1948–53 are given as far as they are available.

Details of refinery output of major products for most countries is also tabulated for the six-year period, as is also information regarding petroleum products exported from and imported into most countries.

The remainder of the book is a useful compilation of similar data in regard to the world's minerals.

Glosario Tecnico de la Industria del Petroleo (Technical Glossary of the Petroleum Industry). Buenos Aires: Instituto Sudamericano del Petroleo, Seccion Argentina, 1952. Pp. 619 + xiv. $8.00.

The Argentine Chapter of the South American Petroleum Institute has done a considerable service to the petroleum industry in compiling this glossary of terms in the Spanish language equivalent to terms used in Great Britain and the U.S.A. Much research has gone into the production of this volume, and its value to those who have to deal with the very considerable petroleum industry in South America cannot be underestimated.

British Standards :

B.S. 736 : 1955. Centrifuge Tubes and Sedimentation Vessels for the Determination of Visible Dirt in Milk. Pp. 11. 2*s*. 6*d*. net, post free.

B.S. 1131 : 1955, Pt 1. Plain Bearings (Metal). Part 1 : Dimensions of Non-ferrous Solid Bushes and Thrust Washers. Pp. 24. 4*s*. net, post free.

B.S. 1131 : 1955, Pt 2. Plain Bearings (Metal). Part 2 : Dimensions of Wrapped Bushes and Thrust Washers. Pp. 22. 4*s*. net, post free.

B.S. 1131 : 1955, Pt 3. Plain Bearings (Metal). Part 3 : Dimensions of Medium-walled and Thick-walled Bearing Half-liners. Pp. 20. 4*s*. net, post free.

B.S. 1131 : 1955, Pt 4. Plain Bearings (Metal). Part 4 : Dimensions of Thin-walled Bearing Half-liners and Thrust Half-washers. Pp. 55. 7*s*. 6*d*. net, post free.

B.S. 1131 : 1955, Pt 5. Plain Bearings (Metal). Part 5 : Bronze Oil-retaining Bushes and Thrust Washers. Pp. 21. 4*s*. net, post free.

B.S. 1570 : 1955. Flanged Steel Plug Valves for the Petroleum Industry (excluding Wall-head and Flow-line Valves). Pp. 32. 10*s*. net, post free.

B.S. 2557 : 1955. Screwdrivers and Screwdriver Bits for Recessed Head Screws. Pp. 24. 4*s*. net, post free.

B.S. 2559 : 1955. Screwdrivers (not including Ratchet Screwdrivers or Screwdrivers and Bits for Recessed Head Screws). Pp. 27. 4*s*. net, post free.

B.S. 2561 : 1955. Forged Steel Pipe Fittings Screwed with API Thread for the Petroleum Industry. Pp. 12. 3*s*. 6*d*. net, post free.

B.S. 2567 : 1955. Steel Roller Conveyors. Pp. 9. 2*s*. 6*d*. net, post free.

ABSTRACTS

	PAGE
OILFIELD EXPLORATION AND EXPLOITATION	
Geology	95 A
Geophysics and Geochemical Prospecting	97 A
Drilling	97 A
Production	98 A
Oilfield Development	98 A
TRANSPORT AND STORAGE	99 A
REFINERY OPERATIONS	
Refineries and Auxiliary Refinery Plant	99 A
Distillation	100 A
Solvent Extraction and Dewaxing	101 A
Cracking	101 A
Hydrogenation	101 A
Chemical and Physical Refining	102 A
Special Processes	102 A
Metering and Control	102 A
PRODUCTS	
Chemistry and Physics	103 A
Analysis and Testing	103 A
Engine Fuels	104 A
Gas Oil and Fuel Oil	104 A
Lubricants	104 A
Bitumen, Asphalt, and Tar	105 A
Special Hydrocarbon Products	106 A
Miscellaneous Products	106 A
CORROSION	106 A
ENGINES AND AUTOMOTIVE EQUIPMENT	107 A
SAFETY PRECAUTIONS	107 A
MISCELLANEOUS	107 A
BOOK REVIEW	108 A
ADDITIONS TO THE LIBRARY	108 A

AUTHOR INDEX

The numbers refer to Abstract Numbers

Aldridge, C., 918
Apostolescu, V., 894

Balaceanu, J. C., 967
Ballard, E. C., 993
Banner, E. H. W., 961
Banta, N. S., 1010
Bender, R. O., 987
Benjamin, E. C., 1017
Berger, M., 928
Bertolette, W de B., 987
Bisko, V., 1025
Boultbee, A. H., 946
Bourgeois, E., 980
Brock, J. A., 949
Buck, B. O., 931
Buriet, R., 909

Cash, G. H., 1008
Cerrone, M., 1005
Clark, W. G., 935
Conlan, P. B., 933
Conlan, R. B., 929
Corrigan, T. E., 965
Craig, R. G., 962
Crico, A., 943
Cundelan, J. V., 1017

del Grande, R., 1003
Depowski, S., 906
Dougherty, P. F., 924
Dubis, W., 912
Duren, G. W., 931

Edwards, J. L., 1016
Enright, R. J., 963
Evans, J. C., 978

Favre, J., 973
Fleming, C. L., 982
Foster, A. L., 950
Fouche, R., 963
Franck, H-G., 1004
Fuchs, W., 974

Gasquet, R., 926
Gentry, R. M., 977
Goodger, E. M., 986
Granet, I., 966
Grieve, R. O., 891
Grote, H. W., 951
Grünwald, A., 971
Gunther, V. H., 977

Haensel, V., 951
Harding, S. R. L., 889
Harris, J. F., 970
Helm, C., 918
Henquet, R., 1022
Hertwig, W. R., 949
Hixon, F. E., 1007

Ivanov, V. S., 1006

Jones, H. F., 985
Jungers, J. C., 967

Koppe, P., 997
Kramers, H., 941
Kullmann, W., 972
Kunstmann, F. H., 970
Kuropiesska, J., 995

Len, H., 930
Lewick, W., 992
Lohmann, G., 972
Löpmann, B., 956
Luchterowa, A., 884
Lundberg, H., 897
Lundeen, R. W., 935
Lyles, H. R., 955, 957
Lynn, C. V., 922

McClaslin, J. C., 890
McEachern, D. J., 913
McGee, D. A., 904
McGiven, J. M., 1019–20
Mallinson, H., 1005
Menard, H. W., Jr., 883
Mirsceva, E. A., 1006
Mischke, K., 902
Montgomery, D., 937
Morrisey, N. S., 885–6
Munro, J. D., 1009
Murray, C. A., 1010
Myszliwiec, J., 1002

Nelson, W. L., 953
Niemann, G., 969
Niemientowski, S., 975
Noll, H. D., 953
Norton, R. D., 936
Nüssel, H., 1000

Oblad, A. G., 945
Odass, F. B., 948
Oehler, H. A., 940
Orgeval, M., 893

Padovani, C., 1023
Paraszczak, W., 911
Pearson, G. H., 934
Petrovsek, J., 964
Pietsch, H., 974
Polubarinova, P. Ya., 910
Pratt, H. R. C., 944

Ramsey, R. P., 1015
Reay, W. H., 960
Renouard, G., 895
Rettig, H., 969
Revenda, J., 968
Rick, B., 999
Rick, W., 999
Rio, A., 1003
Robert, L., 973
Rodrigues, F., 942
Royle, D., 985
Rumeau, J-L., 895
Russum, L. W., 949
Rzepecki, S., 905

Salmon, P., 1018
Sander, O., 908
Sayer, R. G., 985
Schall, J. W., 952
Schulze, K., 998
Shannon, R., 927
Sheffield, J. V., 948
Sherwood, P. W., 954, 958–9
Shkirich, A. H., 910
Sikora, F., 996
Smith, D. T., 896
Sonnenkalb, O., 916
Soukiassian, L., 976
Spengler, G., 972
Steel, R. A., 949
Steinrath, H., 1013–14
Sterba, M. J., 951
Stevenson, D. H., 952
Stroud, C. D., 1012
Strzetelski, J., 899
Szybinski, V., 988
Szypula, K., 898

Temme, T., 1001
Thayer, W. W., 920
Thirion, B., 962
Toulmin, L. D., 887
Tripp, R. M., 1024

Vallaud, A., 1018
van Winkle, M., 940

Wiebe, B., 984
Wilhelmi, R., 998
Wilk, Z., 909
Williams, G., 983
Willis, R. L., 903
Winter, C. Y., 888
Wolwowicz, B., 925

OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

883. Deep-sea channels, topography, and sedimentation. H. W. Menard, Jr. *Bull. Amer. Ass. Petrol Geol.*, 1955, **39**, 236.—Sediment deposited by turbidity currents is increasingly being identified in the geological column and on the deep sea floor. It would appear that in some environments turbidity currents may be dominant agents transporting and depositing sediment. The present study is concerned with the topography of the sea floor, which quite independently of sediment sampling gives another type of evidence by which to determine the existence of turbidity currents, and to judge their importance relative to other agents of sedimentation in the deep sea. The type and distribution of much of the minor topography of the NE. Pacific basin can, according to the author, be correlated with the accessibility of a known area to turbidity currents. E. N. T.

884. An attempt at application of bacterial strains as indicators of oil-bearing quality of the given area. A. Luchterowa. *Bull. Polish Inst. Petrol.*, 1954, **4**, 3. (Suppl. to *Nafta* (*Krakow*), 1954, **10**.)—Some micro-organisms found in the soil convert gaseous hydrocarbons into carbon. 120 mixed cultures were tested at depth of 3 metres on perforated plates, 24 of these thrived. These 24 were then tested in the lab with C_3–C_4 mixture at 4%, 0·4%, and 0·04% concn. 3 mixtures were transplanted twice, and each time their incubation period shortened. M. S.

885. Ellenburger—it's a magic word in West Texas. N. S. Morrisey. *Oil Gas J.*, 3.1.55, **53** (35), 78.—The emphasis of exploration in the W. Texas Permian basin is to discover Ordovician Ellenburger production at depths of 12,000–14,000 ft. Hitherto much of the pre-Pennsylvanian production has been closely related to Permian producing areas, and since many of these structures have not been tested deeply, a large potential Ellenburger production probably exists in these areas.

Recent developments have indicated that several Ellenburger fields will each have ultimate recoveries of over 100 million brl. Most of them have an active water drive, with pay thicknesses ranging from *ca* 140 to 380 ft. Structures

are anticlinal with strong folds in the Palæozoic reflected as gentle folds in the younger beds above the unconformity at the base of the Permian.

The geology of the W. Texas basin is outlined, and a number of maps and sections are included. C. A. F.

886. Dora Roberts trend—West Texas' most active deep-development area. N. S. Morrisey. *Oil Gas J.*, 10.1.55, **53** (36), 74.—Field developments along the Dora Roberts trend of W. Texas are outlined. The trend is a line of folding on the W. side of the Midland basin which trends N.–S. and parallels the Central Basin Platform. It has at least 500 ft of relief, and it may be faulted along the E. flank.

4 fields have been discovered along the trend since 1953, and these produce from fractured Ellenburger dolomitic limestone and the Devonian. Main target is the Ellenburger, and the fields are being developed rapidly. Further discoveries are anticipated. C. A. F.

887. Cenozoic geology of Southeastern Alabama, Florida, and Georgia. L. D. Toulmin. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 207.—Cenozoic sediments underlie all of the SE. U.S. coastal plain south of the Cretaceous outcrop. They rest on sedimentary rocks of the Gulf series (Upper Cretaceous) throughout the area, except in a few places along the Fall Line in E.-central Georgia, where Upper Eocene rocks overstep the Cretaceous and rest on crystalline rocks. The Paleocene series consist chiefly of marine clastic deposits in SW. Alabama and the Panhandle of Florida, limestone in SE. Alabama, and dolomite and anhydrite in peninsular Florida. The Eocene series consist chiefly of marine clastics with limestone at the top, which in peninsular Florida is entirely non-clastic. The Oligocene series is predominantly limestone where present, but is absent in E. Georgia and E. and central parts of Florida. Miocene and post-Miocene deposits consist chiefly of marine clastics. E. N. T.

888. Southern Alabama's largest oilfield. C. V. Winter. *Oil Gas J.*, 10.1.55, **55** (36), 152.—The geology of the Pollard field in S. Alabama is described. The field was discovered by I. A. W. Moye in 1952 following gravity and magnetic work, and the well was completed for 315 b.d. of 30° oil from Cretaceous (Woodbine) Moye sand. The structure is a faulted anticline on the S. side of a graben which interrupts the Gulf Coast monocline dipping SSW. at 50 ft/mile; anticlinal conditions are due to fault drag, and there is production from both sides of the fault.

Pays are sands within the Tuscaloosa group (Upper Cretaceous), the most prolific being the Moye, which is partly clayey and has an average gross thickness of 91 ft. Porosity ranges from 13 to 40%, and oil gravities from 25·6° in structural low wells to 30·1° in high wells.

Drilling and completion practice are briefly indicated. C. A. F.

889. Regional discussion of the Cardium formation. S. R. L. Harding. *Canad. Min. metall. Bull.*, 1955, **48** (513), 19.—The geological history, regional distribution, and variation in character of the Cardium formation are discussed and illustrated by a series of maps and cross-sections. The relationship of the Cardium sand with the Bad Heart sand of the Spirit River–Grande Prairie area is also discussed and illustrated. The locations of the Cardium oil discoveries are shown in relation to the regional stratigraphic and structural picture, and the prospects for future discoveries are indicated. W. W. G.

890. Oil search extends to Cod County. J. C. McCaslin. *Oil Gas J.*, 3.1.55, **53** (35), 153.—Wildcats are to be drilled in the E. half of New Brunswick in the Maritime Provinces of Canada. Only one field has been found in the state; the Stony Creek field discovered in 1909. This has a proved acreage of 1830 and supports 43 gas wells and 17 pumping oil wells. Reserves at Oct. 1950 were estimated at 475,500 brl, and cumulative production to the end of 1952 was 451,889 brl oil and 24,207,852 M.c.f. gas. Production comes from a series of bituminous shales and sands in the Mississippian Albert. The field is on a monoclinal fold on the north limb of a syncline; accumulation is controlled by limiting porosity and permeability conditions. C. A. F.

891. Leaching of Silurian salt beds in Southwestern Ontario as evidenced in wells drilled for oil and gas. R. O. Grieve. *Canad. Min. metall. Bull.*, 1955, **48** (513), 12.—In SW. Ontario, salt is generally present in the Silurian Salina formation to the W. of a line extending southerly from the vicinity of Kincardine, through London, to the N. shore of Lake Erie. The aggregate thickness and number of salt beds present vary with basin position. Within the salt basins numerous areas, which range from a few hundred acres to many square miles, are noted for the complete absence of, or a marked thinning of salt beds. Sub-surface data from many of these areas indicate that salt was deposited and later removed. Subsidence of the overlying strata is attested by the structural features now present.

Locally, removal of the salt appears to have been related to flexures or faults which, through fracturing, may have provided access to the salt beds for solvent waters. Subsidence occurred as early as late Salina time and continued intermittently until after Hamilton time. W. W. G.

892. Iraq field opened. Anon. *Oil Gas J.*, 10.1.55, **53** (36), 63.—The Rumaila field, 20 miles W. of Zubair in SE. Iraq has started commercial production with the completion of a pipeline to Zubair. 4 wells are producing *ca* 8000 b.d. from the Middle Cretaceous Zubair 3 sand at *ca* 10,500 ft.

A wildcat is being drilled in N. Kuwait on a possible southerly extension of the Rumaila structure. C. A. F.

893. Salinities in relation to tightness of cover. G. Renouard. *Rev. Inst. franç. Pétrole*, 1955, **10** (1), 26–9.—The Yohmar well of S. Békaa (Lebanon) provided cores, the central parts of which were tested for the salinities of their waters. These salinities, together with those measured on waters recovered in drill stem tests were marked alongside the electric logs at the appropriate depth and in association with the lithological log. It was found that the lower part of the Senonian, the Turonian, Cenomanian, and uppermost Albian contained freshwater, while the under- and overlying beds had saline water. The freshwater-bearing beds were mainly limestones and dolomites, frequently fissured. The Paleocene was believed to constitute a seal, and in the underlying fractured Senonian gas and some very viscous oil were found. A structural map indicated 125 m closure, and 130 m of the Senonian has saline waters. This is suggestive of isolation via the closure. The freshwater is believed to have entered at the outcrop of the Middle Cretaceous, and pressures and temp in the flushed zone suggest interconnexion. G. D. H.

894. Distribution of some ostracods in the Lutetian of the Paris basin. V. Apostolescu. *Rev. Inst. franç. Pétrole*, 1954, **9** (12), 703–6.—Material collected and described long ago has been re-examined and classified in accordance with modern taxonomy. The marine Lutetian was divided into 3 lithological zones, but large foraminifera and echinoids indicate 4 zones. The material is from 18 areas which are shown on a map, and comes from Zone IV (sandy limestone), Zone II–III (sandy glauconitic limestone), and Zone I (basal gravel). A table shows the distribution of the ostracods in the various zones. There are 58 species or sub-species, 15 being new. They belong to 25 genera, Monsmirabilia being a new genus.

Species found in Zone II occur also in Zone III, suggesting similar ecologic conditions. 18 species are restricted to Zone IV. The organisms seem to be linked with certain facies. G. D. H.

895. Oil investigations in the Rhodanian Couloir. M. Orgeval and J-L. Rumeau. *Rev. Inst. franç. Pétrole*, 1955, **10** (1), 3–25.—The area discussed lies between the Saône and the Swiss border, and then extends S. through the Valence basin. In the latter region the stratigraphy from the Stephanian to the Miocene is described, with notes on any indications of oil

in the various formations. Important structures in this area are the Saint-Lattier and Varacieux anticlines. It is concluded that the Oligocene could be tested on the former structure after some seismic work or core drilling. The Aquitanian marls give cover, and sands occur in the Aquitanian, Oligocene, and Eocene, with possible buried hills of Cretaceous or Jurassic. The Jurassic provides a more difficult problem, because of uncertainties as to facies and extent of erosion.

In the N. area the Mazerolles and Miserey structures may provide Triassic objectives, and the Dogger is adequately covered at Laveron and Haute-Joux. A detailed gravimetric study should precede seismic work. G. D. H.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

896. Geophysical methods of oil prospecting. Pt III. Magnetic methods. D. T. Smith. *Petroleum, Lond.*, 1955, **18** (3), 86–90.—Magnetic methods are used primarily for preliminary investigation. Used where strong magnetic anomalies are associated with oil-bearing structures, but as independent exploration techniques they have too many disadvantages. Useful in reconnaissance work, especially aeromagnetic surveying in which large areas of virgin territory are covered at high speed and relatively low cost. J. B. S.

897. Many factors involved in finding oil by airborne scintillometers. H. Lundberg. *Oil Forum*, 1955, **9** (1), 23.—Although the connexion between oil accumulations and the emission of γ radiation is hypothetical, experience has shown many cases where a low intensity area has revealed a new oilfield or has been found to exist over a known field.

The 2 important steps in the search for oil using scintillation counters for radiation survey are: the mapping technique and the interpretation of the results. From an aircraft, a much greater area is scanned than is the case when the instrument is resting on the ground, thus cancelling out local variations and giving a more accurate picture of the radioactivity of the underlying formation. The preferred height for airborne surveys is from 200 ft upwards to 600 ft.

The interpretation of the results to indicate oil accumulations is an elaborate process that requires geological knowledge and considerable experience. W. W. G.

898. Hydrochemical studies in oil exploration. K. Szypula. *Nafta (Krakow)*, 1954, **10**, 56–8, 76–8.—Saline waters and H_2S have long been observed to occur with oil deposits and served as advanced signs of oil. The reasons for the presence of particular compounds in soln are investigated by petroleum geochemistry. Soviet scientists, in particular W. A. Sulin, have discovered certain "oil-bearing indicators" and prepared "oil-bearing forecast maps." His is the classification of waters according to their composition and occurrence: Na_2SO_4 waters, $NaHCO_3$ waters, $MgCl_2$ waters, and $CaCl_2$ waters. Waters change from one composition to the next: the anions change from Cl^- to SO_4^{--} and to HCO_3^-, the cations change from Na^+ to Mg^{2+} and Ca^{2+}. Surface and near-surface waters are mainly rich in Na_2SO_4, shallow underground waters contain $MgCl_2$, and going deeper we meet $NaHCO_3$ and $CaCl_2$. Anions are the basis for division into groups and cations for further sub-divisions, but a better classification is provided by taking these ions in percentage gram equivalents. Now, $([Na^+] - [Cl^-])/[SO_4^{--}]$ ratio less than 1 is a feature of "Na_2SO_4" type, and greater than 1, a feature of "$NaCHO_3$" type; $([Cl^-] - [Na^+])/[Mg^{2+}]$ less than 1 indicates "$MgCl_2$" type and of greater than 1, the "$CaCl_2$" type. Groups are defined according to $SO_4^{--}/2Cl^-$ ratio. However, as a primary indication of petroleum, Sulin uses I^- and naphthenates, as a secondary the presence of "$CaCl_2$" or "$NaHCo_3$" types in conjunction with absence of SO_4^{--}. Presence of sulphides or S also helps in forecasting. Third in order are the tracer elements Br, Ba, Sr, P, Li, Ce, Rb, and V, whose presence indicates oil, but the reason for that is not explained. Forecasting work includes not only analyses and maps of waters of the area but also a comparison of the latter with geological, geophysical, and geochemical maps. The Polish I.P. carried out 218 analyses (each with a blank) for I^-, Cl^-, HCO_3^-, SO_4^{--}, SiO_3^{--}, Ca^{++}, Mg^{++}, $Na^+ + K^+$, NH_4^+, H_2S, and CO_2. Tenfold variations were observed. Exceptionally high results were 1 gm SO_4^{--}/litre. Naphthenic acids were not encountered. "Bitumen Index" (by luminosity) and tracer elements (by spectroscopy) were also analysed. I^- has not been found at all. The interaction of hydrocarbons and sulphates is illustrated by the reaction $2Na_2SO_4 + 2CH_4 = Na_2S + 2NaHCO_3 + H_2S + 2H_2O$.

Reference is made in particular to analyses on 10 samples obtained in one district. These are tabulated with respect to the more common ions, and the less common are mentioned in the text. Several Soviet books are listed in the bibliography. M. S.

899. Application of the Gauss theory of error in probability calculation for interpretation of geochemical investigations. J. Strzetelski. *Bull. Polish Inst. Petrol.*, 1954, **4**, 3–4. (Suppl. to *Nafta (Krakow)*, 1954, **10**.)—Technical improvements will not eliminate anomalous results and personal errors. Each result contains therefore $a \pm x'$ (true value $\pm$ error). Gauss' statistical analysis allows the correct interpretation of these results. M. S.

DRILLING

900. Use of jet bits. R. Burlet. *Bull. Ass. franç. Tech. Pétrole*, Jan. 1955 (109), 55–95.—The various articles on the evolution and use of jet bits are reviewed. In these interrelations of rate of advance, weight on the bit, speed of rotation, velocity through the jets and through the annulus are examined. Consideration is given to the various causes of pressure loss in the mud circulating system, and methods of calculating these losses are given. Examples from American practice indicate as much as 50% increase in rate of advance and 50% reduction in the number of bits by using jet bits in some cases. Jet bits have also been used by the S.C.P. in a number of wells in the Miocene marls of the Rharb, with good results. Details are given in a number of instances where the bits have been employed under satisfactory conditions. G. D. H.

901. Ingenious apparatus facilitating the lowering of pipes and rods at high speed. Anon. *Nafta (Krakow)*, 1954, **10**, 66.—Described with diagrams. M. S.

902. Small scale mechanization in cable drilling. K. Mischke. *Nafta (Krakow)*, 1954, **10**, 78–82.—Aims at elimination of some manual work. Tabular analysis of workshop and field work shows what can be done. M. S.

903. New explosive cementing tool. R. J. Enright. *Oil Gas J.*, 3.1.55, **53** (35), 64.—A new borehole tool which explodes cement into perforations is described briefly. The tool is run in on a wire line to the required level and detonated; a powder charge is ignited and expanding gas from the explosion forces the rubber packer to expand against the casing, and also shears a pin attaching an aluminium nose to the bottom of the cement container, thereby forcing the cement from the tool.

The tool has proved most successful in squeeze jobs to shut off water and in correcting leaking shoes or bridge plugs. The service is only slightly cheaper than conventional squeeze methods, but there is much saving in cement and rig time. C. A. F.

904. Economics of offshore drilling points to need for more drilling units. Pt 1. D. A. McGee. *Oil Forum*, 1955, **9** (1), 26.—Since the signing of the Federal Tidelands Bill, there has been increased activity in drilling operations in the Gulf of Mexico. Early wells drilled out at sea made use of a self-contained platform. *Ca* 90% of all wells drilled in the Gulf to date have used a small platform-floating drilling tender, but the mobile device of the submersible barge type, first used in open Gulf waters in June 1952, is now becoming

increasingly used. This type of unit is at present limited to water depths up to 40 ft, but several devices are being constructed for use in water up to 100 ft in depth.

Sufficient time has elapsed and an adequate number of wells have been drilled and produced to give a fairly good idea of the costs of drilling out at sea. Although the cost of a water crew per month may be 4 times that of a land crew in the coastal area of Louisiana and Texas, the much greater production of the waterborne crews results in the cost per profile obtained being approx 75% of the land cost. W. W. G.

905. Science technique in Soviet Union—organization and wages system in drilling enterprises of the Soviet petroleum industry. S. Rzepecki. *Nafta (Krakow)*, 1954, **10**, 63–6.—In each oil-bearing area there is an Association directly responsible to the Ministry and in command of: (1) oil search enterprise; (2) groups of production drilling units; (3) exploitation enterprises for the area and their sub-divisions; (4) repair workshops; (5) cementing enterprise; (6) central research laboratory; (7) transport enterprise. In addition, outside the orbit of direct responsibility of the Association are: (1) planning office; (2) office of standards (scientific); (3) office of working standards. Detailed establishment is given for each branch. M. S.

906. Science and technique in Soviet Union—some problems from exploratory drilling after crude and gas in U.S.S.R. S. Depowski. *Nafta (Krakow)*, 1954, **10**, 90–2.—Article goes over preparatory geological work leading to technical and economical plan. This depends on the geological knowledge of the area. An anticline should be drilled in a pattern of geometrically straight lines at intervals of 1–2 km. Various kinds of drilling with various objectives are mentioned. Rules for coring and cementing are given for each kind. Analyses to be done are mentioned where applicable. When a producing reservoir has been found it is commonly "shot" to raise production. If only water is found in an oil-bearing area its level must be watched. All the data relating to all drillings should be kept because of their mutual relationship. 8 refs to Soviet literature are appended. M. S.

907. Vigorous oil search in Sinai. Anon. *Oil Forum*, 1955, **9** (2), 48.—The National Petroleum Co of Egypt, under the technical management of the Southern California Petroleum Corpn, completed Feiran No. 2 well on 4 May 1954, for a production on test of 1500 b.d. of 23° gravity oil. This production was from another zone to that from which the Feiran No. 1 well was tested by the former holders of the lease—Standard Oil Co of Egypt.

A second producing area has been found by the National Petroleum Co of Egypt as a result of the successful drilling of Belayim No. 1 well, which was brought in with a production of 2170 b.d.

Both these oilfields are within a short distance of the coast in the Gulf of Suez. W. W. G.

PRODUCTION

908. Day-by-day electrical control in petroleum and natural gas production. O. Sander. *Erdöl u. Kohle*, 1954, **7** (10), 651.—In recent years there has been an increasing application of electrification in the petroleum and natural gas industries. This has given rise to a demand for the development of security measures and for the training of personnel to carry out the necessary control. A system for the organization of efficient control is described, and details are given of official security regulations as applied to electrical installations, particular attention being given to precautions against accident, fire, and explosion. W. W. G.

909. Preparations prior to water injection into oil-bearing formation. Z. Wilk. *Nafta (Krakow)*, 1954, **10**, 53–6.—Unless water injection is based on most accurate knowledge of the formation and its history a considerable quantity of crude may be permanently lost in it through such process. A 3-dimensional detailed map must be produced giving the location of all boreholes, properties of all rocks, and all operations carried out in the past. Polish oil-bearing formations appear to be exhausted, but they are fairly shallow. If there is more oil below these century-old fields this will have to be obtained according to scientific principles, so the subject is always going to be topical. A graph showing "water (in)–crude (out)" relationship in one field over 1943–51 in litres/10^4 sq. metres shows that at the beginning and end of that period oil produced was less than 10 litres/10^4 sq. metres, but water injection, which stood at *ca* 800 litres/10^4 sq. metres in 1943 and was stopped in 1948, caused a 30-fold rise in production during these years. The success was due to a thorough knowledge of the formation.

The choice of place for injection and source of the water are important. M. S.

910. Problem of the displacement of oil-bearing contours. P. Ya. Polubarinova-Kochina and A. R. Shkirich. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tech. Nauk*, 1954, (11), 105–7.—Effect of wells on shift of oil–water interface is examined in the lab with glass models, using glycerol–air to replace oil–water; results are shown photographically. V. B.

911. Kafarov's method in Polish oilfield practice. W. Paraszczak. *Nafta (Krakow)*, 1954, **10**, 67–9.—Kafarov's method involves a thorough investigation into likely slackness in oil production, be it overloading of pumps, accumulation of mud and sand at the bottom of the wells, or lack of understanding of pumping principles amongst the crew. By entrusting each section of work to a team specializing in maintenance of that part of equipment Kafarov created groups of workers who kept a finger on the pulse of their particular section of activity over the whole field.

Intervals between overhauls were increased considerably. Production rose, and several old wells were re-opened. This method has been applied in Poland, giving approx 20% increases in production. M. S.

912. Association activities. W. Dubis *et al.* *Nafta (Krakow)*, 1954, **10**, 98–100.—General meeting at Krosno on 30 Jan. 1954 reported improvements in field exploration, in speedier and more economical drilling, and in reconditioning of equipment. Progress was reported in educational field, but not enough lecturers toured the oilfields. Further projects were approved. Technical conference of small inventors on 18 March 1954 saw a demonstration of portable rig JL7-Rudno-800 m. Industrial plan for production and drilling in March 1954 was exceeded. M. S.

OILFIELD DEVELOPMENT

913. Development of Golden Spike field. D. J. McEachern. *Canad. Min. metall. Bull.*, 1955, **48** (513), 25.—The Golden Spike oilfield was discovered by the drilling of Imperial Schoepp No. 1. The well was completed on 18 April 1949 at an initial potential of 7320 b.d., the oil having a gravity of 36° API and an estimated gas–oil ratio of 500 cu. ft/brl. The field is some 25 miles SW. of Edmonton.

In order to produce the allowable quantity of crude oil at the reservoir pressure decreased, a gas lift installation was completed by 31 March 1953. At the same time, a 50-b.h.p. compressor engine was installed to inject surplus gas back into the formation. To maintain high flowing production and to increase the ultimate recovery of the field, injection of natural gas into the reservoir is carried out to maintain the pressure at approx 1800 p.s.i. The gas plant is described and illustrated. W. W. G.

914. Sicilian field producing. Anon. *Oil Gas J.*, 10.1.55, **53** (36), 63.—Commercial production has started in the Ragusa field, Sicily, discovered in 1953. 3 wells have been completed, each producing *ca* 550 b.d. of 19·5°–21·0° oil. A thick limestone pay has been proved, topped at *ca* 6200 ft. Further exploration is planned in the provinces of Siracusa, Ragusa, and elsewhere. In Italy, production totals only *ca* 1500 b.d. from small fields in the Po Valley, but substantial

amounts of gas are being produced. New structures have been discovered in the Venetian sector of the Po Valley which are to be tested. C. A. F.

915. New crude oil in areas in Rumania. Anon. *Nafta (Krakow)*, 1954, **10**, 71.—A brief history of Rumanian oil production from Roman times to the end of the last war precedes the description of development since. In 1947 production was 3·8 million tons p.a. Plans for 1955 talk of 11 million tons p.a. In particular, deposits in Moldavia proved to be very rich near Moinesti and in Zemesului Valley. Other deposits were found in Pitesti district and in Oltenia. Petroleum equipment is now made in Rumania and exported. M. S.

TRANSPORT AND STORAGE

916. Transport problems in international petroleum economy. O. Sonnenkalb. *Erdöl u. Kohle*, 1954, **7** (10), 678.—The oil industry is closely bound up with the development of the Otto and diesel engines. In Germany, on 1 Jan. 1954, the oil industry catered for 4,338,414 power-driven vehicles of all kinds. The economic development of the oil industry includes not only crude oil production and refining, but also sales and transport organization. The place of tankers (sea-going, coastal, and canal types) in the oil economy is discussed and compared with the use of pipeline transport for crude oil, oil products, and natural gas. The transport of oil in the U.S.A., in Europe, and in the Near East is dealt with and a comparison is made of the freight charges for various types of transport, particularly in Germany. W. W. G.

917. Pipeliners see big year in 1955; review expansion last year. Various. *Pipe Line News*, 1955, **27** (2), 21–6.—Reports from 16 companies indicate that continued expansion is likely in oil and products lines, and a large expansion in natural gas lines is predicted in 1955. B. A. F.

918. World's longest offshore pipeline. C. Aldridge and C. Helm. *Oil Gas J.*, 14.3.55, **53** (45), 118.—Details are given of the longest marine pipeline to be completed this year by Magnolia Petroleum Co in the Gulf of Mexico. The line is 48 miles in length and 12 inches dia, and will be used to transport crude oil from Eugene Island area to the Louisiana coast. G. A. C.

919. Automatic controls for gas pipelines. Anon. *Oil Gas J.*, 7.3.55, **53** (44), 129.—The qualities in the future for automatically controlled main-line compressor stations are discussed in the light of rising labour costs and normal advances in controls. G. A. C.

920. Pipeline weld inspection. W. W. Thayer. *Oil Gas J.*, 28.2.55, **53** (43), 115.—The use of radio-active sources for inspection of pipeline welds necessitates precautions in handling. Promising materials are discussed, and safeguards against overdosage and carelessness are recommended. G. A. C.

921. Standardized drop fuel tanks. Anon. *Engineer, Lond.*, 1955, **199**, 200.—Plastic drop tanks in 6 standard sizes from 50 to 500 gal have been developed, to provide additional external fuel capacity for aircraft, and thus increase their range and endurance. Good jettison characteristics are ensured by an adjustable fin. Thousands of these tanks were expended during Korean war. 100-gal tank was flown on Hawker "Hunter" at supersonic speeds without affecting performance. A. C.

922. Rising cost of oil storage tanks. C. V. Lynn. *Oil Gas J.*, 14.3.55, **53** (45), 104.—Economies can be effected by correct selection, sound construction, and efficient upkeep of tanks, with timely retirement of existing vessels. Foundations, floating and pontoon roofs, tank ht, and roof skirts are all matters for consideration. G. A. C.

923. Movements of petroleum through the Suez Canal. Anon. *Petrol. Times*, 1.4.55, **59** (1504), 326.—A study of figures of Suez Canal traffic over several years, the nationality of that traffic, and the N.–S. and S.–N. movements of petroleum through the canal in 1954 gives an index of refinery development in the N. and S. of the E. Hemisphere. U. M.

924. How Sun created underground storage. D. F. Dougherty. *Oil Gas J.*, 28.2.55, **53** (43), 109.—Sun Oil Co is now operating at its 15,000-b.d. Sarnia, Ontario, refinery the first underground salt caverns to be used for process storage of LPG products, with a total capacity of 150,000 brl. Estimated future capacity after other completions is 500,000 brl.

An example of an underground storage problem is given and the solution calculated from data presented. G. A. C.

925. Liquid asphalt transportation. R. Wolwowicz. *Nafta (Krakow)*, 1954, **10**, 95–8.—Paper describes with drawings the Polish road tank—a well insulated 5-ton cistern trailer and an 85-h.p. engine to draw it. The cistern consists of one chamber and is covered with glass wool. Temp drop from 230° to 225° C occurs in one hr during motion. Max speed—30 m.p.h. The Soviet units are all in one. They carry 3, 3·5, or 5 tons, are equipped with heaters and pumping units, and can be used as sprayers. Diagrams and a table follow. M. S.

926. Tanker discharge. R. Gasquet. *Bull. Ass. franç. Tech. Pétrole*, Jan. 1955 (109), 137–47.—Pipe network on board tankers is described, with diagrams; pump layout and pump types are briefly considered. French petroleum ports (except Lavera) are considered to have inadequate discharge facilities. Log given for typical fortnight at Lavera, max discharge rate 1300 tons/hr (*cf* Coryton 2000 tons/hr). V. B.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

927. Refinery maintenance. R. Shannon (Ed.). *Petrol. Refin.*, 1955, **34** (3), 129–85.—The first section of the report deals with the problems associated with determination of length of runs for process units. It shows the results of a survey and gives the current practice on items such as length of run and stream time efficiency. Also there is a mathematical treatment of the economics involved in optimum run length determinations. Example is given, and describes the improvement in efficiency on solvent units.

The second section is based on the fact that the most important factor in determining frequency of turn-arounds is corrosion. Corrosion rates as determined by inspection form the basis for planning the replacement or alteration of components. Items such as organization and administration of inspection are dealt with, also inspection of specific items such as pumps, valves, pressure vessels, and heat exchangers.

The report finishes with a discussion on methods and means of expediting the work, together with the chemical cleaning of towers, thermal de-coking of process heater coils, and correct use of tools and materials. R. L. R.

928. Simplify your liquid-hydrocarbon mixing. M. Berger. *Oil Gas J.*, 24.1.55, **53** (38), 120.—A nomogram is provided

which solves problems in mixing crudes or any hydrocarbon liq to a desired *sp. gr.* An example is worked out.
G. A. C.

929. Cooling tower wood can be protected. R. B. Conlan. *Petrol. Engr*, 1955, **27** (1), C13–18.—Attack of cooling tower wood may be chemical or biological in nature. Chemical attack causes delignification, and is usually due to sodium carbonate or high pH of water. It is overcome by controlling pH by acid treatment and Dianodic treatment using phosphate and chromate to inhibit pitting. Biological attack occurs in the presence of oxygen, and is minimized by the same methods as for chemical attack. J. B. S.

930. Lead " bronzes " in refitment economy in petroleum industry. H. Len. *Nafta (Krakow)*, 1954, **10**, 59–61, 82–8.—To effect economy in tin " bronzes " lead can be substituted. Patent was taken out in May 1939, and first factory in Poland producing bearings started work after the war. 20–40% Pb can be used if a steel inlay is incorporated. Alloy has to be cooled very rapidly. All the usual technical methods of casting can be employed. Addition of Ni and Ag helps to maintain homogeneous structure. Most accurate inspection of these bearings for internal fissures is required. Properties are listed, but the more important ones are : Brinell Hardness = 22°–70°, falling off to *ca* 60% of initial value at 200° C and remaining so. Coeff of friction at 0·3–0·5 metres/sec and 35–350 kgm/sq. cm remains between 0·004 and 0·0055. The alloy's spongy structure retains lub oil, and if lubrication has been accidentally forgotten the oil exudes at 350° C. Such bearings are most reliable, and those used by Hungarian Danube Sailing Co were not changed between 1941 and 1953. This indicates what economy can be achieved if all machinery used in the petroleum industry was provided with Pb " bronze " bearings. The Central Executive is urged to order such change-over. M. S.

931. Perforated plate trays do a better job. G. W. Duren and B. O. Buck. *Oil Gas J.*, 28.2.55, **53** (43), 122.—Innovations in the design of the West Seminole gasoline plant of Cities Service Oil Co include partial demethanization in the absorber reboiler, and universal application of perforated plate trays for all process vessels, including absorber, rich-gas deethanizer, amine and caustic treaters, and fractionators. Plant is operated by 2 men/tour, and total operating and maintenance force is 22. A flow sheet is given. G. A. C.

932. To figure condenser costs. Anon. *Chem. Engng*, 1955, **62** (3), 116.—An abstract of a paper by W. E. Ellingen, read before ASME, gives a method of estimating total condenser costs from charts. The costs included air-removal equipment, circulating pumps, condensate pumps, etc. Correction factors for several materials of construction are given and corrections for different types of pump and other minor adjustments are given. The minor adjustments can be neglected in first estimates, but are needed for final costing figures. D. J. S.

933. Using chlorine, copper, and phenolic compounds. P. B. Conlan. *Oil Gas J.*, 24.1.55, **53** (38), 117.—Use is described of chlorine, copper salts, and phenolic compounds to control slime and algæ growths in water. G. A. C.

934. The design of balanced stop valves—II. G. K. Pearson. *Fluid Handl.*, March 1955, (62), 69.—Following Pt I, on the general principles of screw-down stop valves and double beat valves, this paper enlarges upon the problems of the latter. Equations are developed for the proportions of upper and lower seatings and the width of seat contacting faces, which is dependent on line pressure, seating dia, permissible unit clamping pressure, angle of seating, and friction angle of the seating materials. The design of glands and stuffing box for a frequently operated valve is discussed, and the frictional resistance for 2 types of " automatic " packing is determined. D. J. S.

935. How much for rubber-lined vessels ? R. W. Lundeen and W. G. Clark. *Chem. Engng*, 1955, **62** (3), 191.—Cost curves are presented to assist in estimating the charges for rubber-lined tanks and pressure vessels. The data cover a wide variety of shapes and sizes. D. J. S.

936. 13 ways to solve packing problems. R. D. Norton. *Chem. Engng*, 1955, **62** (3), 183.—The wear on shafts and packing in process pumps for liq containing abrasives can present a serious problem. The author suggests 13 possible solutions to a frequently occurring problem. D. J. S.

937. Chemical weed and grass control in the petroleum industry. D. Montgomery. *Petroleum, Lond.*, 1955, **18** (3), 99–102.—Weeds and grass on refinery sites can be tackled effectively and economically with chemicals. The kind of problem and conditions under which it occurs determine the type of chemical required and manner of use. Some of the conditions influencing choice of weed killer and method of use are outlined. J. B. S.

938. The new refinery at Trombay. Anon. *Petrol. Times*, 1.4.55, **59** (1504), 333.—A short report is given of the new Burmah–Shell refinery on Trombay Island, nr Bombay, which was opened 17 March 1955. The refinery will process 2 million tons of crude oil/year, and its production of gasoline, kerosine, diesel fuel, and furnace oil will be the highest in India.
U. M.

939. 50 years BP-Benzin- und Petroleum GmbH. Jubilee celebration and survey of the refinery extensions. Anon. *Erdöl u. Kohle*, 1954, **7** (10), 673.—On 9 Sept. 1954, the BP Co entertained over 1000 guests, members of the German and foreign oil industry, from Hamburg and district, to celebrate the 50th anniversary of the firm.

Details of the refinery extensions include the vacuum distillation unit taken into production in April 1954, increasing the capacity of the refinery by 600,000 tons annually to a total of 1·25 million tons. The platforming unit, the first on the European continent, has a capacity of 250,000 tons annually, and the new bitumen blowing plant has an output of 50,000 tons p.a. of marketable bitumen.

New tanks raised the total storage of the refinery from 180,000 to 320,000 m³. A fourth loading platform has been erected for loading fuel oil and bitumen and a new cooling water station has 2 turbine-driven pumps, each of capacity 5,000 m³/hr.

The refinery employs *ca* 570 people. The total investment cost of building the BP refinery is 45 million DM, of which 50% is for production plant, 25% for tanks, and 25% for auxiliary facilities.

When all the new plant is in operation, the BP refinery will obtain from the crude oil: 28% motor benzine, 23% diesel fuel, 40% fuel oil, 4% bitumen, and 2% gas.
W. W. G.

DISTILLATION

940. Comparisons of T.B.P. and Engler type distillations at subatmospheric pressures. H. A. Oehler and M. van Winkle. *Petrol. Engr*, 1955, **27** (1), C10–12.—An experimental investigation into the relationship between the T.B.P. and Engler type analytical dist curves of a number of petroleum oil stocks was conducted. T.B.P. dist were carried out at 50 mm Hg in an Oldershaw 15 perforated plate column. Engler type dist on the same stocks were determined at 760, 400, 200, 100, and 50 mm Hg. A correlation of the 50% boiling temp of the T.B.P. dist with the 50% boiling temp of the Engler type dist was derived and is reported.

It was found that the slopes of the Engler type curves did not vary with pressure. J. B. S.

941. Heat transfer in a film evaporator. H. Kramers *et al. Ingenieur, 's Grav.*, 25.2.55, **67** (8), 9–15.—After a brief discussion of film evaporation a number of results is presented on the rate of evaporation of various liq in a Müller evaporator. It is shown that evaporation occurs mainly at the surface of the liq film. Liq flow is laminar at normally occurring loads.

Additional heat transfer by nuclear boiling is only appreciable with liq which show a strong tendency to foaming. The main functions of the rotor in the Müller evaporator are: the distribution of liq feed, the catching and redistribution of splashes, the breaking of foam, and the removal of entrained liq from the vapour. 8 figs., one table, and 5 refs.
(Author's abstract.)

942. Nomographs for easy estimating. F. Rodriguez. *Chem. Engng*, 1955, **62** (2), 182.—2 nomographs for dist problems are presented. The first gives Trouton's constant and is used to estimate the v.p.–temp curve, in conjunction with the Clausius–Clapeyron equation when data at only 2 points are available.

The second is a nomograph based upon the Fenske equation, giving the minimum plates at total reflux from a knowledge of relative volatility and the mol fractions of lightest component in dist and bottoms. This nomograph is claimed to be more compact than several previously proposed. Examples in their use are given. D. J. S.

SOLVENT EXTRACTION AND DEWAXING

943. Solvent extraction by pulsating columns. A. Crico. *Chim. et Industr.* (*Génie Chim.* suppl.), 1955, **73**, 57–62.—Introduction of pulsating columns, in which mass transfer is assisted by exterior energy supply by means of pulsations imparted to the liq, is latest chem engineering development in field of solvent extraction. Efficiency of extraction column can thus be increased by a factor of 5–10, moreover, pulsations completely eliminate channelling effects in wide packed columns. Factors governing mass transfer under influence of pulsations imparted to the liq in an extraction column (either packed or fitted with plates) are analysed.
(Author's summary.)

944. Liquid–liquid extraction in theory and practice. H. R. C. Pratt. *Industr. Chem. Mfr*, 1955, **31**, 63–72. (*Cf.* Abs. **822**, 1955.)—Theories of interphase transfer reviewed for the 3 possible cases: (*a*) simple physical extraction; (*b*) physical extraction followed by homogeneous chem reaction, *e.g.* extraction of an acid from a solvent with aq alkali; (*c*) heterogeneous chem reaction at interface, *e.g.* reaction between solute mol either with one another or with mol of one of the solvents. Published data on liq–liq transfer generally derived from extraction columns where interfacial area unknown. Lab experiments reviewed where definite interfacial area employed, *e.g.* by forming droplets at known rate from calibrated jets, or by using stirred "diffusion" cells, or wetted wall columns. Concluded that mass transfer coeff for stirred cell is virtually independent of mol diffusivity, while that for wetted wall column varies as (diffusion coeff)$^{2/3}$; this result cannot be explained by any existing theories of mass transfer. A new hypothesis is advanced which postulates transfer of turbulence through interface from one phase to the other by formation of ripples or by "friction-wheel" mechanism, hence the difference between mass transfer coeff in stirred cell and wetted wall column, latter transfer being controlled by streamline rather than turbulent conditions. 69 refs.
A. C.

CRACKING

945. Catalysis. A. G. Oblad. *Oil Gas J.*, 21.3.55, **53** (46), 184.—A summary is given of the status and possible future of cat in the petroleum industry. Included are definitions of terms used in cat work, a discussion on kinetics, nature of active centres, mechanisms of cat reactions used in refining petroleum and of metal cat reactions. G. A. C.

946. What's ahead for catalysis? A. H. Boultbee *et al.* *Oil Gas J.*, 21.3.55, **53** (46), 177.—Predictions are made on how cat processes will help in the development of future refining techniques. These include cat cracking of crude residua in shale oil, higher octane from paraffinic naphthas, increased yields of middle dist, and increased fuel qualities. Future requirements include pilot method for testing cat, better cat, and increased knowledge of mechanism of cat. G. A. C.

947. Catalysis for petroleum refining. Anon. *Oil Gas J.*, 21.3.55, **53** (46), 140.—Flow sheets and flow descriptions are given for 24 cat processes. These processes include 6 cat cracking, 9 cat reforming, 3 alkylation, 5 hydrogenation, and one polymerization. Typical yields and other operating results are given. G. A. C.

948. Diesulforming. F. B. Odasz and J. V. Sheffield. *Oil Gas J.*, 21.3.55, **53** (46), 203.—The diesulforming unit at the Husky Oil Co's 1000-b.d. catformer at Cody, Wyoming, is described and the process outlined. G. A. C.

949. Factors in selecting a catalytic reforming process. R. A. Steel, J. A. Brock, W. R. Hertwig, and L. W. Russum. *Petrol. Engr*, 1955, **27** (2), C25–32.—Cat reforming is the most practical means for increasing the octane rating of gasoline. 3 processes in use are non-regenerative platinum bed reforming, regenerative non-platinum fluid- or moving-bed reforming, and regenerative platinum fixed-bed reforming. The major factors affecting choice of process, feed characteristics, yield, octane potential, processing cost, and investment are analysed and show that, at current octane requirements, non-regenerative platinum reforming has lowest investment. Fluid molybdena is best adapted to large units and high-sulphur feeds, and regenerative platinum reforming gives the highest yields. J. B. S.

950. Catforming civilizes naphthas. A. L. Foster. *Petrol. Engr*, 1955, **27** (2), C33–6.—The catforming process upgrades low value naphthas to give motor fuel components. The feed is mixed with hydrogen-rich recycle gas and, after heating, passes through a cat of platinum metal on a controlled silica–alumina base. The reformed stream is cooled, then flashed, when recycle gas containing the sulphur as H_2S separates. The H_2S is removed by the Girbitol process. After stabilizing, the naphtha is used for blending.
J. B. S.

951. Rexforming—its product will meet any motor-fuel needs now in sight. H. W. Grote, V. Haensel, and M. J. Sterba. *Oil Gas J.*, 4.4.55, **53** (48), 233.—Rexforming is a new process involving mild cat reforming of a full-range gasoline stock to produce a water-white gasoline of controlled volatility characteristics. Low-octane material in the reactor efficient is removed by solvent extraction. G. A. C.

952. 100 clear octane. H. D. Noll, J. W. Schall, R. G. Craig, and D. H. Stevenson. *Oil Gas J.*, 28.3.55, **53** (47), 102.—Iso-Plus-Houdriforming, a new process, is described for production of 100 F-1 clear octane cat reformate. 2 processing routes are available: (1) a combination of Houdriforming and aromatics extraction, and (2) Houdriforming at moderate severities followed by thermal reforming of the Houdriformate. Both processes are flexible, and each yields high octane product in a continuous operation with nearly all virgin naphthas. Tables show yields and process streams and summary of economics for production of 100 F-1 clear octane gasoline. G. A. C.

953. Chemical composition of oils used in carbon-black manufacture. W. L. Nelson. *Oil Gas J.*, 28.3.55, **53** (47), 145.—2 tables show average properties of hydrocarbons boiling at *ca* 500° F and of some high-boiling aromatic and condensed hydrocarbons (including 3 good carbon-black oils in Table 1).
G. A. C.

HYDROGENATION

954. Hydrogen from petroleum and natural gas. P. W. Sherwood. *Erdöl u. Kohle*, 1954, **7** (10), 626.—A description is given of the methods of producing hydrogen from natural gas and refinery gases. The increased production of hydrogen from petroleum refinery gases in recent years is due to the fact that it is obtained as a by-product in cat reforming and in thermal cracking for the production of ethylene.

The methods of producing hydrogen from light hydrocarbons, such as methane in natural gas, are discussed in detail with special reference to the processes used in the U.S.A., where the principal method is the methane–steam process, which produces a mixture of CO and H_2. The CO is converted into CO_2 by further reaction with steam under suitable conditions in the presence of cat. The CO_2 is absorbed with water under high pressure or with monoethanolamine, and the small quantity of CO present is absorbed with copper ammonium formate. In ammonia plants, methane is usually oxidized with air in such proportions that the product gas contains a mixture of nitrogen and hydrogen in the correct proportion for ammonia synthesis. In such plants the purification of the hydrogen is often carried out by cooling down the gas to −180° C by means of heat exchange with cooled nitrogen–hydrogen gas mixture.

Mention is made of the use of pebble heaters for thermal reforming of methane for the production of hydrogen, and it is suggested that the investment cost of such a plant is lower than that of cat processes for the production of water-gas from light hydrocarbons. W. W. G.

CHEMICAL AND PHYSICAL REFINING

955. Cities Service improves operation, reduces costs. H. R. Lyles. *Oil Gas J.*, 7.3.55, **53** (44), 126.—The installation of a stripping tower of new design in the Unisol unit of Cities Service Refining Corpn's Lake Charles refinery eliminates caustic carry-over, reduces chemical costs, and cuts maintenance charges. A flow diagram is given and operating conditions listed. G. A. C.

SPECIAL PROCESSES

956. The Fischer–Tropsch synthesis with special reference to the operations at the Bergkamen chemical works. B. Löpmann. *Erdöl u. Kohle*, 1954, **7** (10), 622.—The recent developments in the Fischer–Tropsch synthesis are reviewed, a comparison being made between the results obtained when using an iron or a cobalt cat for the conversion of the carbon monoxide–hydrogen gas mixture. The use of the iron cat was developed in the Ruhrchemie-Lurgi and the Rheinpreussen works. Development work in the U.S.A. has also been mainly with the iron cat. The use of the iron cat has definite advantages in that the metal is cheap and very widely available. The benzine obtained from the iron synthesis has the relatively high octane rating of over 90 (Research), whereas that from the cobalt synthesis has the much lower rating of *ca* 60. The disadvantage of the iron synthesis is the higher pressure required and the high proportion of gas recirculation necessary, thereby using more energy than is needed in the cobalt low pressure synthesis as operated at Bergkamen.

The Bergkamen plant was designed for a production of 50,000–60,000 tons p.a., but it can be increased to a figure of 85,000–90,000 tons p.a. Detailed yields of products from this plant are given, together with analyses of the gas mixtures at various stages of the process.

The Bergkamen cobalt process yields unbranched aliphatic hydrocarbons and is a valuable source of pure hydrocarbons of this type for the chemical industry. The process is also a source of straight-chain alcohols and of various solvents of this type.

With regard to the future outlook, it is expected that the costs of the cobalt synthesis can be lowered by the use of cheaper coal for gasification and by improvements in treating the synthesis gas. A possible further development is in the use of a combination of the cobalt and iron cat. W. W. G.

957. New Unisol stripper. H. R. Lyles. *Petrol. Refin.*, 1955, **34** (3), 207–9.—The replacement of a carbon ring packed tower in the Unisol process for a perforated tray tower is described. The tower was used to strip alcohol and mercaptans from 47° Baumé caustic at 300° F. In order to withstand the severe conditions it was constructed of $\frac{7}{16}$-inch Monel metal; the corrosion rate being *ca* 0·02 inches/year. Increased extraction efficiency, less caustic wastage through sludge, and reduced carry-over were the main gains, but a better tower response made better control of tower level possible. R. L. R.

958. Butadiene. P. W. Sherwood. *Chim. et Industr.*, 1955, **73**, 290–5.—Review. 1955 consumption est 627,000 tons (90% for rubber). Main source is now C_4H_{10}, which is either dehydrogenated direct or else in 2 stages, latter process, with butenes as intermediate, being more common. Dehydrogenation processes are cat, operating conditions are outlined, and types of cat and butenes purification procedures are described. Butadiene is purified by extractive dist with furfural or by absorption in cuprammonium acetate. V. B.

959. Making aldehydes from petroleum. P. W. Sherwood. *Petrol. Refin.*, 1955, **34** (3), 201–6.—This third and last article covers the production of aldehydes by the Fischer–Tropsch synthesis. The design of the reactors deals with the major problem of heat removal, together with selection of cat. An analysis of 3 methods for production of acetaldehyde—hydration of acetylene, via vinyl methyl ether, and as a by-product of vinyl acetate production—is given. R. L. R.

960. Some recent developments and future prospects in the petroleum chemicals industry. Pt II. H. W. Reay. *Petrol. Times*, 4.3.55, **59** (1502), 229.—This part surveys the manufacture of intermediate products, including hydrogen cyanide, acetic anhydride, phthalic anhydride–isophthalic acid, and phenol. G. A. C.

METERING AND CONTROL

961. Instrumentation and automatic control in oil refineries. Pt III. Pneumatic recorders and controllers. E. H. W. Banner. *Petroleum, Lond.*, 1955, **18** (3), 91–8.—Recorder-controllers are installed for all important operating variables, mainly temp, pressure, and flow, and sometimes liq level. These recorders are normally of the large circular chart or strip chart type. Various makes of recorder-controller are described and diagrams given. Control valves are also described of both the plunger, butterfly, and rubber diaphragm type and their applications considered. Mention is also made of servo-operated valves and diagrams are given of quick-acting (or poppet) V-port and proportional or ratio valves. J. B. S.

962. New method for viscosity measurement. B. Thirion. *Chim. et Industr.* (*Génie Chim.* suppl.), 1955, **73**, 37–41.—Steel rod is magnetostrictically vibrated at 28 kHz, max elongation $\frac{1}{4}\mu$. Visc of fluid damps oscillations, and hence decreases their mean amplitude, visc is measured by power required to keep amplitude const. Probe can be protected from corrosion by plating (*e.g.* Au). Temp range −120° to +350° C, pressure up to 50 atm, can be used in pipe in which liq flows. Owing to high shear rate results for non-Newtonian liq vary from mechanical viscometer, but are reproducible. Range 0–50,000 cp.g/cm³, or with alternative probe, $5 \cdot 10^5$ cp.g/cm³, accuracy ±2% up to 2000 cp.g/cm³, ±5% at higher vals, reproducibility 2% or better. Recorder can be up to 1 km from probe, multipoint (up to 16) recorder possible. Temp compensation (set for visc–temp slope of liq) up to 100% visc variation, with error of 3%. Typical layouts are shown and use for control is discussed. V. B.

963. Continuous measurement, control, and recording of fluid viscosity. R. Fouché. *Chim. anal.*, 1955, **37**, 56–7.—Brief description of ultra-sonic viscometer (*cf.* preceding abs.). V. B.

964. Electronic control of refinery pumps. J. Petrovsek. *Petrol. Engr*, 1955, **27** (1), C7–9.—Remote control reduces the number of men required and speeds the delivery of product streams. The "Multi-gate" equipment described employs audio-tone signals, 2 tones being used for each function, the first selecting the receiver station, the second performing the required switching operation. J. B. S.

PRODUCTS

CHEMISTRY AND PHYSICS

965. Chemical engineering fundamentals. Catalytic vapour phase reactions—II. T. E. Corrigan. *Chem. Engng*, 1955, **62** (2), 195.—Further absorption equations are developed, and from the examples it is shown that similar equations may be derived for almost all reactions and for most conceivable reaction mechanisms. The effect of inert gases on v.p. reactions is shown. Generalizations from the rate equations are discussed, and a comparison between cat mechanisms and the chain reaction theory for homogeneous reactions is made. The assumptions used in the development of rate equations are listed, and each is discussed to check its validity, and the use of empirical equations to correlate data without considering the mechanism is discussed. D. J. S.

966. Heat transfer performance curves. I. Granet. *Chem. Engng*, 1955, **62** (3), 187.—In order to eliminate tedious trial and error work heat transfer performance curves are given which enable the required heating surface for particular conditions to be found readily. The thermal efficiency is found from the curves, and from this temp rise and area are easily evaluated. The effect of fouling of convection surface may be calculated, as well as the amount of fouling present from a knowledge of the efficiency of the plant after a given time. The curves apply to convective heat transfer, and are not to be used when radiation is the principal means of transferring heat. D. J. S.

967. Applied chemical kinetics. XI. Heterogeneous catalysis. J. C. Jungers and J. C. Balaceanu. *Rev. Inst. franç. Pétrole*, 1955, **10**, 30–92, 128–50 (*cf.* Abs. **825**, 1955).

ANALYSIS AND TESTING

968. Analysis of mineral oil acid sludges. J. Revenda and V. Szybinski. *Chem. Tech.*, 1954, **6**, 284–7.—Previously proposed methods are critically reviewed, and a new procedure, based on variation of earlier method (*cf.* Abs. **267**, 1936) is described. This gives content of inorg matter, sulphonic acids, H_2SO_4, and is based on extraction of sludge with a 1 : 1 benzene–phenol mixture. Experimental details are given and results on numerous sludges tabulated, method is widely applicable (sludges, waste acid, sulphonates, sulphonic acids). V. B.

969. The FZG gearwheel rapid test for the examination of gear oils—description, conditions, and results of the test. G. Niemann and H. Rettig. *Erdöl u. Kohle*, 1954, **7** (10), 640.—A description of the method of testing gears and gear oils as used by the Munich Research Station for Gear Wheels and Gear Oils (Forschungsstelle für Zahnräder und Getriebebau—FZG). The test applies to gear oils suitable for hypoid gears for back axles of automobiles, that is, for oils containing corrosion-prevention additives designed to stand up to this high duty. W. W. G.

970. Microanalytical method for boron estimation in coal. F. H. Kunstmann and J. F. Harris. *BrennstChemie*, 1955, **36** (1–2), 20–3.—A volumetric method is described for B estimation as B_2O_3 after complete incineration of the material and separation, as methyl borate, by dist. The apparatus is illustrated. 24 literature refs. R. T.

971. Classification of crude oils and their products. A. Grünwald. *Erdöl u. Kohle*, 1954, **7** (10), 633.—A discussion is presented on methods used for comparing the paraffinicity of petroleum dist, particularly in the motor oil range. A method has been worked out for practical application in solvent refining, depending on the sp. gr. of fractions having a vise of 100 cs at 50° C. As an illustration of the method, a nomogram is presented showing its application in selective solvent refining using furfural and nitrobenzene as solvents. W. W. G.

972. A dynamic method of testing lubricating greases. G. Spengler, W. Kullmann, and G. Lohmann. *Erdöl u. Kohle*, 1954, **7** (10), 636.—The Kugelfischer grease-testing machine, designed by Prof. G. Spengler, is described, and examples are given of its application to the development of formulations for grease manufacture. The relationship between frictional resistance and temp of a motor-driven bearing is shown on a recording chart or on a stroboscope, so that comparisons of results given by greases of different compositions are readily observed. W. W. G.

973. Infra-red spectrometry in the analysis of mineral oils and greases. L. Robert and J. Favre. *Rev. Inst. franç. Pétrole*, 1955, **10**, 164–9.—In range 7–15 μ IR spectra of various sat oils show little difference, but aromatic-containing oils have bands characteristic of various groupings, main such bands and their probable significance are illustrated by typical spectra. Synthetic oils can be differentiated from mineral oils, likewise lub additives and greases have spectral features (examples given) which permit detection of these components in mixtures. V. B.

974. Infra-red spectroscopy as an aid to the quantitative analysis of hydrocarbon mixtures. W. Fuchs and H. Pietsch. *Erdöl u. Kohle*, 1954, **7** (10), 631.—The use of infra-red spectroscopy for quantitative analysis is growing, especially in the U.S.A. The authors give results obtained with a semi-automatic infra-red spectrograph (made by Leitz, Wetzlar) with double refraction and rock salt lens. The application of the Lambert–Beer law makes it possible to estimate the composition of binary (toluene–*n*-hexane) and tertiary (toluene–benzene–*n*-hexane) systems with an error of 1·3–1·7%. The method can be extended to systems of more than 3 unknown components. W. W. G.

975. Chromatography as a new method for separation of hydrocarbons. S. Niemientowski. *Nafta* (*Krakow*), 1954, **10**, 84–9, 113–16.—Author reviews the classical and modern theory of absorption. Hydrocarbons and oxy-compounds are absorbed on various materials, depending on their dipole moments. Empirical rules worked out before the advent of electrostatic theory are still valid. Processes allied to chromatography are stripping, percolation, and vapour phase adsorption. Methods used in the lab on a pilot plant scale and production scale are described, with special attention to the first. Polish, German, American, French, and Russian sources are quoted. M. S.

976. Present position of the IFP strobo-cathodic manograph. L. Soukanssian. *Rev. Inst. franç. Pétrole*, 1955, **10**, 170–80.—Principle of stroboscopic recording of indicator diagrams is described and a detailed description is given of the development and present pattern of the IFP apparatus. V. B.

977. Water solubility in liquid propane. R. M. Gentry and V. H. Gunther. *Oil Gas J.*, 28.2.55, **53** (43), 131.—The effect is discussed of vol, temp, and propylene content of the sample on the sensitivity of the NGAA cobalt bromide test for moisture in commercial propane. G. A. C.

978. 325 degrees below zero. J. C. Evans. *Oil Gas J.*, 28.3.55, **53** (47), 123.—E.m.f. and resistant type temp instruments for liq air separation units at −325° F are described, and advantages, disadvantages, and accuracy are discussed. G. A. C.

979. A mobile laboratory. Anon. *Petrol. Times*, 18.3.55 **59** (1503), 278.—A description is given of the mobile lab ordered by the Ministry of Supply and now undergoing practical tests by the R.A.S.C. at Farnborough, Hants. G. A. C.

ENGINE FUELS

980. Contemporary problems of gasoline utilization. E. Bourgeois. *Bull. Ass. franç. Tech. Pétrole*, Jan. 1955 (109), 111–22.—Discussion of factors involved by changes in *d*, gum content, and volatility. Recent decrease of gasoline *d* (0·735 → 0·715) calls for some carburettor readjustment on small French engines; certain gum problems arose (mid-1953), but have since subsided; increasing fuel volatility has caused some difficulty with icing and vap lock. V. B.

981. Values and residual fuels: Brightray coating proves successful. Anon. *Oil Eng*, March 1955, **22** (261), 414.—Account of standardization of Mirrlees K-class oil engines to Brightway coated silicon–chromium values so that residual fuels may be burned. Brief details of the development work carried out and 5 photographs are included. C. B.

982. Can better fuels curb engine knock? C. L. Fleming *et al. Oil Gas J.*, 28.2.55, **53** (43), 100.—The Esso Laboratories present detailed field data for the effect of fuel volatility on octane requirement increase, and conclude that the elimination of high-fouling materials in motor fuel reduces such requirements by reducing combustion chamber deposits. For typical 1953–54 model cars an octane advantage of 5·7 is obtained by using volatile fuel with multi-visc lub. G. A. C.

983. Tuning a high-speed oil engine. A comprehensive study expressed in concise form. G. Williams. *Oil Eng*, March 1955, **22** (261), 424.—The maintenance of a high-speed oil engine is described. The fuel injection system and its adjustment, the significance of exhaust smoke, its colour and smell, and the quality of fuels and lubricants are discussed. C. B.

984. Alcohol–water injection in Otto cycle engines. R. Wiebe. *Erdöl u. Kohle*, 1954, **7** (10), 643.—The article is based on a report of the U.S. Dept of Agriculture on the use of alcohol–water injection in gasoline engines, particularly in tractors. By the use of alcohol–water injection, it is possible to economize in the consumption of high-octane components and a cleaner engine is obtained, especially with straight-run fuels. W. W. G.

985. Fuel features related to operating experiences in motor ships using low cost fuels. H. F. Jones, D. Royle, and R. G. Sayer. *Trans. Inst. Mar. Engrs*, 1955, **67** (2), 37.—During the past few years the shipping industry has requested for diesel-engined vessels an increasing supply of fuels intermediate in character between the conventional diesel and boiler grades. Samples of the fuels bunkered were retained from 3 such cargo vessels operating from the U.K., 2 of which were engaged on the Mediterranean route, and the third to Australia. Information was also obtained from a tanker operating mainly between the Gulf and American NE. coast ports. The fuels were analysed in some detail, and their effect on engine performance was noted. From the rather limited amount of information available some general conclusions were made. Certain properties of the fuel, such as sp. gr., visc, fl. pt., and sediment and water contents are important because of the type of fuel system installed prior to the main engine fuel pump. For instance, the amount of steam heating available limits the visc of the fuels that can be bunkered. The fuels originating from the W. Hemisphere usually contain appreciable amounts of asphaltenes, and to achieve clean combustion it may be necessary in certain instances to advance the period of injection. T. T.

986. Explosive limits in aircraft fuel tanks. E. M. Goodger. *Petroleum, Lond*, 1955, **18** (3), 81–5, 106.—The factors influencing the occurrence of explosive inflammation in fuel tanks are discussed. Explosive conditions for each of the main aviation fuels are examined and compared with operating conditions within the vapour space of the tanks, showing the effects of fuel temp, altitude, fuel spray, air release, "breathing" or diving, and tank pressurization. Danger areas can be defined for each fuel, but the large number of factors involved makes it difficult to find completely safe operating conditions for any fuel. J. B. S.

GAS OIL AND FUEL OIL

987. Additives improve distillate fuels. R. O. Bender and W. de B. Bertolette. *Fuel Oil & Oil Heat*, 1955, **14** (3), 63.—The use of various additives for the improvement of the following properties is discussed: colour, stability, sludge or gum stability, filterability of the aged fuel, pour and cloud points, rust prevention, and combustion quality. D. K.

988. Fuel oil in central heating. Anon. *Petrol. Times*, 4.3.55, **59** (1502), 220.—This is a review of the present position regarding fuel oil burnt in domestic central heating plants in the U.K. Some 46,000 tons were consumed in 1954, an increase of 20% over 1953. G. A. C.

LUBRICANTS

989. Science and lubrication. Anon. *Petrol. Times*, 1.4.55, **59** (1504), 323.—A report is given of the facilities and work at the Mechanical Engineering Research Laboratory of the D.S.I.R. The Lubrication Division is concerned with fundamental reactions occurring when 2 loaded surfaces slide over one another and the mode of action of lub material serving to separate them; with basic research into modes of lubrication and occurrence of wear in specific machine elements; and with investigations involving the application of research results to the solution of industrial problems. Lab equipment and techniques in use for various studies are described. U. M.

990. Canadian lub oil plant last word in design. Anon. *Petrol. Engr*, 1955, **27** (2), C11–12.—Work has started on a plant with capacity of 2000 b.d. of 5 different oils. The plant is designed for continuous operation. From the vacuum pipe still, the dist flows to a phenol plant for removal of sludge-forming compounds. It then passes to a ketone dewaxing unit, and after hydrofining to reduce oxygen, nitrogen, and sulphur compounds the finished oils are blended and packed. J. B. S.

991. Modern grease manufacture. Anon. *Industr. Chem. Mfr*, 1955, **31**, 76–80.—Description with photographs of Vacuum Oil Co's new grease plant at Birkenhead (*cf.* Abs. **856**, 1955). A. C.

992. Hydrodynamic lubrication of roller bearings. W. Lewicki. *Engineer, Lond.*, 1955, **199**, 348–9.—Reply to written objections raised against author's article under same heading (*cf.* Abs. **108**, 1955). A. C.

993. Sludge formation in passenger-car engines. R. L. Willis and E. C. Ballard. *Oil Gas J.*, 7.3.55, **53** (44), 110.—Bench tests, lab engine and road tests have shown that a du Pont ashless polymeric detergent is the most promising agent in suspending sludge and carbon. The detergent is a nitrogen-containing copolymer of lauryl methacrylate and diethylaminoethyl methacrylate. Engine tests suggest that content of benzene and resin insolubles in the used oil is influenced by the type of detergent in the oil. Electron photomicrographs illustrate the article. G. A. C.

994. Reduction of cylinder wear when operating on boiler oil. Anon. *Mot. Ship*, Jan. 1955, **35** (418), 425.—Details are given of the development and wear-rate figures determined in sea-trials of a new Shell cyl lub. The oil is a stable water-in-oil emulsion with a visc in the SAE 50 class, containing special additives to prevent corrosive wear, and results of trials show that it reduces considerably the wear rates obtained with both straight mineral and HD type oil. U. M.

995. Quick method of determination of soaps in solid greases. J. Kuropiesska. *Bull. Polish Inst. Petrol.*, 1954, **4**, 4. (Suppl.

to *Nafta* (*Krakow*), 1954, **10**.)—Method consists of titration with alcoholic HCl of an EtOH/C_6H_6 extract using conductometric end point determination. M. S.

996. Quantitative determination of water in cresol. F. Sikora. *Nafta* (*Krakow*), 1954, **10**, 61–3.—The best solvent of lub oil extraction has proved to be cresol with 6–10% water. By mixing known quantity of each inaccurate results were obtained, due to presence of moisture in "pure" cresol. B.p. determinations are affected by presence of hydrocarbons. Author recommends estimation by production of acetylene by water present, 1 g of which gives 622·6 ml of C_2H_2 at N.T.P. Acetylene is collected over water saturated with acetylene. It is formed in a kind of Kipp's apparatus from known quantity of wet cresol and excess CaC_2. M. S.

BITUMEN, ASPHALT, AND TAR

997. Investigations on the contact surface relations with cutback bitumen emulsions and their chip mixtures. P. Koppe. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (1), 30.—Differences between cutback bitumen (one-phase) and cutback bitumen emulsions (2-phase) are explained, and the significance of the differences in their properties related to their use in bituminized chip production. Both static—usual with cutback bitumen—and dynamic considerations enter into the observation of contact-surface relations. Since the aq and the oily phases can be varied, the thermodynamic requirements which a cutback bitumen must fulfil are met easily. By addn of small amounts of surface-active substances both in the aq and oily phase, by adjusting the pH val, and by high concn of adhesive in the contact surfaces the most varied types of cutback bitumen emulsions can be produced. The quantity of H_2O used in determining waterproofness of the mixed material is of decisive importance. Tests are: a short water jet; storage in a limited quantity of H_2O; prolonged storage under flowing H_2O. The first is preferred. R. T.

998. Contact surface phenomena in the system water–bituminous binder and their importance for constructional practices. Pt 2. Influence of water on binder adhesion to solid bodies. R. Wilhelmi and K. Schulze. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (1), 12–20.—The so-called adhesiveness tests of DIN 1995 and 1996 give only an estimate of the visible binder skin displacement by H_2O from stone surfaces, but no indication of the firmness of the adhesion. Investigations show that a binder skin may be displaced by wandering accumulated H_2O to give a closed film removable like rubber. Drying restores the adhesiveness. Accumulated H_2O under the film and loss of adhesiveness are not visible externally. Displacement visible externally under the microscope occurs only on contact of H_2O with the solid body, which arises from bursting of the film over a bubble. H_2O causes rapid bursting on the edges of binder-coated chips where surface tension (γ) thins the films. Knowledge of γ between binder and H_2O, and of contact angle (θ) between binder and solid, does not suffice to explain the displacement mechanism, because θ in a state of rest differs from θ val of displacement (motion). The magnitude of θ after attaining a state of rest is quite const, but γ changes during H_2O accumulation. A basic difference exists between visible binder displacement and true adhesion of binder to solid bodies. Traces of H_2O can penetrate every binder film and influence adhesion without visible displacement. R. T.

999. Moisture absorption by roofing paper. Pt 1. W. Rick and B. Rick-Weismann. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (1), 26–8.—A concrete case where 2% of H_2O was found in a covering led to this investigation. Absorption of H_2O is obtained from the difference in wt of strips of bare paper, glass fleece, jute fabric, plastics, etc., 70 × 100 mm, after drying over $CaCl_2$ and subsequent exposure for 1 day, 1 week, 1 month to air saturated with aq-vapour, at ambient temp. The theory of the location of the absorption—inlay or dusted bitumen covering—is presented. Approx information is given by conversion to the org inlay, whose quantity strongly influences H_2O absorption. The exposed edges of the strips introduce a weakness into the experiments. Results given in an extensive tabulation are explained. Relative merits of thin and thick coatings, steeping, effects of sweating of structures, vapour diffusion through porous stone, and advantages of breathing are discussed. R. T.

1000. The wet sand method for producing bituminous coverings. Pt 2. H. Nüssel. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (1), 24–5.—A brief, illustrated article on the successful use of wet sand mixtures of varying granulation in Germany. Mixtures and construction are given. R. T.

1001. Retrospect on the last year's experiences in the use of bituminous mixed macadam. T. Temme. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (1), 7–11.—A critical review—with illustrations—of observations made when investigating the use and methods of applying mixed macadam coatings—hot or cold—on streets, paths, etc., for light and heavy traffic. R. T.

1002. On filling concrete troughs with molten bitumen to make blocks. J. Mysliwiec. *Nafta* (*Krakow*), 1954, **10**, 70.—This method of supplying asphalt (in blocks) is quite good, especially in winter, and eliminates use of drums. M. S.

1003. Researches concerning the influence of asphaltenes on technological characteristics of bitumen. A. Rio, M. Cerrone, and R. del Grande. *Chim. e Industr.*, 1955, **37** (4), 262–9.—In order to investigate the influence of asphaltenes on the constitution and properties of bitumen, the authors studied the thermal susceptibility and the main rheological and mechanical characteristics of bitumens, which were reconstituted for this purpose, with different amounts of these components. The results that were obtained show the favourable action of increasing percentages of asphaltenes as well as the influence on this action of their chemical constitution, in connexion with that of their dispersant phase, the maltenes. (Authors' summary.)

1004. True nature of coal tar pitch. H-G. Franck. *Brennst-Chemie*, 1955, **36** (1–2), 12–30.—From 1946 to 1953 pitch production in the Federal German Republic rose from *ca* 189,000 to 832,700 tons. Pitch contains *ca* 5000 of the 10,000 compounds present in tar, of which *ca* 55, 32 aromatic hydrocarbons and 23 heterocyclic compounds—as tabulated—have been identified chem with certainty. Investigations of the composition of pitch by dist and use of selective solvents and conclusions are discussed fully. Pitch may be viewed as a solid solvate of components of similar type whose binding properties result from a development of the plastic state, conditioned by the filling of chem similar materials present. It is important for the plasticity that no component predominates quantitatively. *Ca* 90% of coal tar pitch consists of 3- to 7-nuclear aromatics with mol. wt. 170–380; the remainder consists of higher-mol, soot-like compounds which are neither sol in powerful solvents, *e.g.* pyridine, nor distillable, and whose constitution, therefore, cannot be revealed by chem means. Up to now coal tar pitch has attained no importance as raw material for pure preparation manufacture, with the possible exception of fluoranthene. R. T.

1005. Contribution to colloidochemical analysis of coal tars Pt 2. H. Mallison. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (1), 22–3.—Further ideas on the analysis of coal tar with selective solvents are discussed. High-mol (H) tar resins are insol in powerful solvents, *e.g.* high-b.p.-bases aniline, quinoline, etc., and in nitrobenzene and anthracene oil. Medium-mol (M) and low-mol (N) tar resins are colloidally-sol in anthracene oil (with contained phenols and bases). Anthracene oil + pyridine gives an arbitrary separation of H-resins containing *ca* ½ M-resins, useful for estimating the % of high-mol constituents in tar and pitch. Anthracene oil or nitrobenzene is used for separating and estimating the last highest-mol materials in electrode pitch where a high cont is valued.

M-resins are sol in anthracene oil, insol in benzene (toluene). The benzene-insol is the sum of the H- and M-resins. For a closer identification of the M-resins division into M_1- and M_2-resins is advisable using pyridine as solvent, as shown in the following scheme :

	Insol in	Sol in
H-resins.	anthracene oil + pyridine.	
M_1-resins.	pyridine.	anthracene oil + pyridine.
M_2-resins.	toluene.	pyridine.
N-resins.	methanol.	toluene.

Coke yield from tar and pitch may be determined as the sum of the yields from the separate tar fractions. Calculation by the following formula is better :

$$\% \text{ coke} = 80\% \text{ H} + 60\% \text{ M} + 54\% \text{ N}$$

Only the 3 tar-resin fractions are taken into account, not the resins contained in the medium-mol (M) and low-mol (N) tar oils. R. T.

SPECIAL HYDROCARBON PRODUCTS

1006. Causes of increase of dielectric loss of oil and of deterioration of electrical characteristics of transformer insulation. V. S. Ivanov and E. A. Mirzoeva. *Elektr. Stantsii*, 1954, (12), 24–8.—Oil oxidn apparatus described; glass vessel, 96° C, reflux condenser, either air blown or static, metal cat; test for sludge, acidity, H_2O-sol acids. Investigation of cause of deterioration of oils in transformers showed one of the causes to be the use of 0·2% pour depressor (paraflow type), as permitted by USSR trans oil spec; oils containing depressor gave worse results for p.f. and chem tests in lab oxidn than base oil alone. Deteriorating effect of paraflow could be eliminated by treatment of oil + depressor with bleaching earth, pour point of oil was not thereby raised. V. B.

MISCELLANEOUS PRODUCTS

1007. Sulphur and sulphuric acid from petroleum. F. E. Hixon. *Chem. & Ind.*, 1955, 332–40.—Types of S compounds occurring in petroleum are summarized. Their conversion to H_2S, methods of recovering H_2S, and its conversion to elemental S are described, with particular reference to Shell sulphur recovery plant, Stanlow (flow diagram given). Refinery uses of sulphuric acid are considered, including typical analyses of resultant acid sludges, whose decomposition to liberate SO_2 is described, with flow diagram of Shell unit, conversion of SO_2 to sulphuric acid being by normal Contact process. B. S. W.

1008. Carbon black. G. H. Cash. *Engng J., Montreal*, 1955, **38** (2), 102.—The history of early carbon black production in the U.S.A. is outlined, the industry moving from the Eastern states as the price of natural gas increased, to such districts as Texas Panhandle. The increasing value of natural gas has caused the inefficient channel process to be replaced by oil furnace processes which can use petroleum refinery residues as raw material. A plant of this type, the Cabot Carbon Plant at Sarnia, Ontario, is described and illustrated. W. W. G.

CORROSION

1009. Corrosion prevention in cooling water heat exchangers. J. D. Munro. *Petrol. Engr*, 1955, **27** (1), C35–50.—The deterioration of materials exposed to cooling water in an exchanger is caused by numerous corrosion phenomena created by particular characteristics or the environment influence of the water. These phenomena and process and mechanical design are discussed, along with constructional materials, maintenance, cleaning, etc. J. B. S.

1010. How corrosion-inhibitor solved refinery fouling problems. N. S. Banta and C. A. Murray. *Oil Gas J.*, 14.3.55, **53** (45), 126l—An inhibitor of the semi-polar organic compound type which is absorbed from oil soln to form a protective film on metal surfaces reduced fouling and maintained pressure drop at a low value in the overhead condensing equipment of a T.C.C. unit. Before its use corrosion products lodged in tube bundles caused excessive pressure drops and rendered shut-downs necessary every 3 or 4 months. In another case the addition of an emulsifying chemical and corrosion inhibitor to a troublesome emulsion which formed in a gas–gasoline–water separator broke the emulsion and obtained separation. G. A. C.

1011. Resurgent corrosion fighter. Anon. *Chem. Engng*, 1955, **62** (2), 140.—From holding a minor position as a corrosion inhibitor in anti-freeze compounds, sodium nitrite has assumed an important place in U.S.A. chemical production during the last 5 years. It prevents corrosion in water-circulating systems, water-base paints, stored oil products, metal containers, cutting oils, and grinding compounds. With caustic soda it both protects and cleans oil product pipelines and tanks in light oil service. Combined with sodium phosphate it gives more permanent protection. D. J. S.

1012. Graphical method of checking stability of cathodic-protection rectifier stacks. C. D. Stroud. *Oil Gas J.*, 28.3.55, **53** (47), 126.—A few simple tests and a curve drawn from resulting data are used to check efficiency of dry-type rectifiers used in pipeline protection. G. A. C.

1013. Cathodic protection of pipelines. (I) Principles and methods of catholic protection against corrosion. H. Steinrath. *Erdöl u. Kohle*, 1954, **7** (10), 647.—The principles of cathodic protection against corrosion of iron are discussed. 2 processes of cathodic protection can be used, viz : (*a*) a galvanic arrangement; or (*b*) use of an aux current.

In the galvanic method, zinc electrodes are used for low potential differences between the soil and the metal to be protected, higher potential differences require the use of aluminium or magnesium. To lower the soil resistance, the anode is embedded in a salt, in the case of zinc electrodes, gypsum or sodium chloride or sodium sulphate being used. For aluminium electrodes, slaked lime or sodium chloride, among other substances, are used. Magnesium alloy electrodes have been used embedded in a slip of 50% bentonite, 25% gypsum, and 25% sodium sulphate. W. W. G.

1014. Cathodic protection of pipelines. (II) Application of cathodic protection against corrosion in buried pipelines. H. Steinrath. *Erdöl u. Kohle*, 1954, **7** (11), 728.—Details are given of arrangements for applying cathodic protection against corrosion in buried pipelines as well as in oil wells and in storage tanks. To prevent overheating in the case of buried pipelines and also in oil wells, a thermoregulator may be installed which causes a break in the primary circuit when the temp is too high.

In the U.S.A. auxiliary current is generated by means of dynamos driven by wind turbines, as well as by the conventional gasoline, diesel, or gas engines.

Cathodic protection is also used against corrosion in buried cables, in steel construction under fresh, sea, and brackish water; for inner and outer shells of tanks; for boilers; and for ships. W. W. G.

ENGINES AND AUTOMOTIVE EQUIPMENT

1015. Free-piston gas turbine. R. P. Ramsey. *Oil Gas J.*, 14.2.55, **53** (41), 143.—This, the final article in a series on the free-piston gas turbine, discusses the possible future uses of the machine. G. A. C.

1016. Reheat for gas turbines. J. L. Edwards. *J. Roy. Aero. Soc.*, Feb. 1955, **59** (530), 127.—The present day development position on reheat is discussed under the headings performance, general design requirements, detail investigations (including diffusers, fuel injection, and stabilizers), combustion, ignition, screech, propelling nozzles, and fuel systems. The paper is fully illustrated, and the discussion and author's reply are included. U. M.

SAFETY PRECAUTIONS

1017. Check up on ground connexions. E. C. Benjamin and J. V. Cundelan. *Oil Gas J.*, 24.1.55, **53** (38), 92.—Loose or corroded ground connexions have caused many disastrous fires and serious accidents, and represent particularly serious hazards in oil processing and petrochemical plants. Grounding electrodes, equipment connexions, portable sources of power, welding machines, and lightning protection are dealt with, and diagrams show satisfactory grounding connexions. G. A. C.

1018. Sulphur, an explosion and fire risk. A. Vallaud and P. Salmon. *Chim. et Industr.*, 1955, **73**, 340–3.—S dust is easily ignitable and explodes; considerable static risk exists when humidity $<75\%$. S should be handled with non-sparking tools, trolleys carrying S should run on wooden and not steel rails. Water-spray may be used to eliminate dust hazard. Electric equipment in S plants must be flame-proof, automotive vehicles should keep 20 yd away from S stores, etc. General safety measures to be adopted in plants handling solid S are outlined. V. B.

MISCELLANEOUS

1019. Refinery construction survey. J. M. McGiven. *Oil Gas J.*, 21.3.55, **53** (46), 236.—Survey of refineries shows 2 million brl of capacity under way or nearing completion in the U.S.A. and Canada. G. A. C.

1020. Refinery capacity survey. J. M. McGiven. *Oil Gas J.*, 21.3.55, **53** (46), 208.—The 1955 survey shows capacities state by state in the U.S.A. and Canada. U.S. capacity was 8·7 million brl daily, and Canadian, 610,000 brl daily by Jan. 1955. G. A. C.

1021. The price of oil in Western Europe. Anon. *Petrol. Times*, 18.3.55, **59** (1503), 264.—A summary is given of the E.C.E. report, which studied price relationships and enquired whether prices paid by and charged in W. Europe are consistent with underlying conditions of demand or supply or if there is a lag in price adaptation to present conditions. The summary ends with a review of strains in the present system. G. A. C.

1022. Role of the service company in the petroleum industry. R. Henquet. *Bull. Ass. franç. Tech. Pétrole*, Jan. 1955 (109), 123–35.—Conditions in the U.S.A. and France are compared. In the former drilling is largely by contractors (92% of wells drilled and 85% of drilling rigs). Hitherto, in France, in absence of the competition present in the U.S.A., service companies have played a minor part, but with expanding production it is expected that conditions will approximate more to those in the U.S.A.; employment of service companies should increase efficiency of the industry. V. B.

1023. Air pollution from fuel combustion and processing. C. Padovani. *Riv. Combust.*, 1955, **9** (3), 179–209.—Air pollution induced by fuel combustion (industrial furnaces, domestic fires) and by fuel processing (coal dist and gasification, petroleum refining) is reviewed. Particular reference is made to troubles related to the use of coal gas rich in carbon monoxide and to the exhaust gases from I.C. engines. Methods of measurement and of quant analysis of air contaminants are also dealt with, and actions and regulations designed to prevent or to reduce the emission of harmful agents to the atmosphere are discussed.

(Author's summary.)

1024. You just can't lose. R. M. Tripp. *Oil Gas J.*, 4.4.55, **53** (48), 160.—A review is given of methods of search for commercial quantities and conen of uranium-bearing minerals. Direct detection and geophysical methods are used. The author states that uranium will not replace oil as a source of energy, and that industrial power plants, the best market for atomic energy, represent less than 4% of the petroleum fuel market. G. A. C.

1025. United Kingdom petroleum legislation in 1954. V. Biske. *Petrol. Times*, 4.3.55, **59** (1502), 234.—This review of legislation shows only slight activity in the field concerning petroleum. Safely precautions, customs regulations, trade disputes, and judicial decisions are dealt with, and adequate refs appended. G. A. C.

BOOK REVIEW

The Romanian Oil Industry. Constantin N. Jordan. New York: New York University Press for Mid-European Studies Center of Free Europe Committee, 1955. Pp. xv + 357. $10.

Mr Jordan has compiled a valuable permanent work of reference for all those interested in the history of the Rumanian oil industry since the outbreak of the second world war.

The story of the Soviet penetration of this great industry, the largest in Europe outside Soviet Russia, which began immediately following the armistice concluded with Rumania in 1944, reached its most significant phase when the Communist government imposed upon Rumania nationalized the British- and American-owned companies in 1948, and culminated in 1951 with the taking over of the entire industry by the Sovrompetrol Company, a so-called "joint" Russo-Rumanian concern under Russian management, is told clearly and well.

The author's description of the various steps by which the Russians attained their objective provides an interesting case-history in Communist exploitation, which is made the more topical by the recent remarks on this subject by Sir John Kotelawala at the Bandoeng Conference.

Mr Jordan proceeds to a detailed examination of the various aspects of the industry: oilfield equipment and supplies, labour force, exploration and geology, drilling, production, oil reserves, refining, transport, marketing, and consumption, in which he contrasts the situation prior to 1948 with supposed developments thereafter. The material which he has assembled is well set forth in language which demands little or no technical knowledge from the reader. A great deal of informative data is included, and there are some 50 tables dealing with every aspect of the industry, together with some well-conceived diagrams and maps.

For information prior to 1948, when the nationalization of the industry took place, the book relies largely on the *Moniteur du Pétrole Roumain*, that memorable oil journal which, under the editorship of Mihai Pizanty, faithfully recorded happenings concerning the Rumanian oil industry from the turn of the century until the Communist government suppressed it. The author admits that his information regarding more recent developments is perforce gleaned largely from reports appearing in the Communist-controlled Rumanian press, though, thanks to his personal experience in the Rumanian oil industry, he is able to interpret these reports wisely and well and to supplement them with apparently sound information from various private sources. He is, indeed, to be congratulated on the workmanlike manner in which he has documented the whole of his book.

In a short final chapter Mr Jordan speculates as to the future pattern of the oil industry in Rumania following its liberation from Soviet domination. He rightly emphasizes the complex nature of the problems involved, but is, perhaps, less than fair when he remarks that "in the specific instance of the petroleum industry, foreign capital received an adequate return on investment for several decades" and then goes on to suggest that, following liberation, "the problem of eventual indemnities for prejudices suffered by foreign capital must come in last place." The first statement certainly cannot be reconciled with the experience of those in Western Europe and America who put very much larger sums of money into Rumania than they were ever able to draw out of it and whose losses by reason of the expropriation of the oil industry must amount to over £100 million. Moreover, it is difficult to see how Rumania's oil industry could take its place again in the oil economy of the Free World unless and until fair treatment were accorded to those who discovered and developed this source of wealth for the Rumanian nation.

This brief criticism aside, Mr Jordan's book can be wholeheartedly recommended as a useful addition to the reference libraries of all those concerned with Rumanian oil matters, while, as Mr C. E. Black's foreword suggests, it can be read with profit by all of us facing the threat to freedom posed by Communist economic and political imperialism.

J. N. C.

ADDITIONS TO THE LIBRARY

Organic Reagents for Metals. Vol. 1. Edited by W. C. Johnston. 5th edition. London: Hopkin & Williams Ltd., 1955. Pp. 199. 15*s*.

Since the appearance of the 4th edition of this work in 1943 individual monographs on organic reagents for metals have been published separately. Fourteen such monographs have appeared, and these, together with thirteen new ones, make up the present publication. The scope of the work has been extended also to include reagents for acid radicals and for certain organic functional groups. Details are also given of the Karl Fischer reagent for water and its use.

A Systematic Handbook of Volumetric Analysis. Francis Sutton. 13th edn., revised by Julius Grant. London: Butterworths Scientific Publications, 1955. Pp. 752. 63*s*. net.

It is 20 years since the publication of the 12th edition of this well known reference book on analytical methods was published. In completely revising and largely re-writing the work, Dr Grant has in general followed the basic plan of the earlier editions. He has, however, brought all the general theoretical material together in Part I in preference to its distribution throughout the text. The remaining nine chapters cover methods and apparatus, acidimetry and alkalimetry, oxidation on reduction, precipitation reactions, electrometric and miscellaneous methods, special applications (inorganic substances), special applications (organic substances), natural waters and sewage, and gases.

Surface Protection against Wear and Corrosion. Cleveland: American Society for Metals, 1954. Pp. vi + 461.

Catalysis. Vol. 2. Fundamental Principles (Pt 2). Ed. P. H. Emmett. New York: Reinhold, 1955. Pp. vi + 473.

Fisher/Tag Manual for Inspectors of Petroleum. 28th Edn. Chicago: Fisher/Tag, 1954. Pp. vi + 218.

IP Engine Test Methods for Rating Fuels. London: Institute of Petroleum, 1955. Pp. x + 84.

Technical Glossary of the Petroleum Industry, English–Spanish, Spanish–English. Buenos Aires: Instituto Sudamericano del Petroleo, 1952. Pp. xiv + 619.

Offshore Summary. E. N. Kemler and E. W. Rosencrarts. Spring Park, Minnesota: Summary Reports, 1954. Pp. 6 + 58 + 333.

Flammable Liquid Trade Name Index. Boston, Mass.: National Fire Protection Association, 1954. Pp. 80.

Condensate Well Corrosion. Natural Gasoline Association of America, Condensate Well Corrosion Committee. Tulsa: N.G.A.A., 1953. Pp. vii + 203.

Acetylenic Compounds in Organic Synthesis. R. A. Raphael. London: Butterworth, 1955. Pp. xii + 219.

Handbook of Dangerous Materials. N. I. Sax. New York: Reinhold, 1951. Pp. viii + 848.

Natural Gas Engineering, 3rd Edn. M. M. Stephens and O. F. Spencer. Pennsylvania State University, 1954. Pp. viii + 578.

Modern Methods of Lubrication : A Summary of 30 years Specialized Research into the Selection, Design, and Application of Lubricating Equipment in the Machine Age. Plymouth : Tecalemit Ltd., 1955.

Who's Who in the Motor Industry. 2nd Edn. Grimsby : Bellamy Publications, 1955. Pp. 883.

Petroleum Facts and Figures. 11th Edn. American Petroleum Institute. New York : A.P.I., 1955. Pp. 322.

A.S.T.M. Standards including Tentatives, 1954 Supplement. Part 6. Rubber, Plastics, Electrical Insulation. Philadelphia : A.S.T.M., 1954. Pp. xiii + 515.

A.S.T.M. Standards including Tentatives, 1954 Supplement. Part 3. Cement, Concrete, Ceramics, Thermal Insulation, Road Materials, Waterproofing, Soils. Philadelphia : A.S.T.M., 1955. Pp. xiv + 395.

British Standards :

B.S. 826 : 1955. Adjustable Steel Shelving (Angle Post Type). Pp. 34. 7*s*. 6*d*. net, post free.

B.S. 1428 : 1955, Pt. D5. Syringe Pattern Micro-Pipette. Microchemical Apparatus Group D : Volumetric Apparatus. Pp. 11. 2*s*. 6*d*. net, post free.

B.S. 1428 : 1955, Pt. D6. Micrometer-operated Burette. Microchemical Apparatus Group D : Volumetic Apparatus. Pp. 12. 2*s*. 6*d*. net, post free.

B.S. 2569 : 1955, Pt. 1. Sprayed Metal Coatings. Part 1. Protection of Iron and Steel against Atmospheric Corrosion. Pp. 7. 2*s*. net, post free.

B.S. 2569 : 1955, Pt. 2. Sprayed Metal Coatings. Part 2. Protection of Iron and Steel by Aluminium against Corrosion at Temperatures between 120° C and 950° C. Pp. 7. 2*s*. net, post free.

B.S. 2573 : 1955. Report on Permissible Stresses in Crane Structures. Pp. 23. 4*s*. net, post free.

B.S. 2583 : 1955. Podger Spanners. Pp. 14. 3*s*. net, post free.

B.S. 2584 : 1955. Ratchet Screwdrivers. Pp. 11. 2*s*. 6*d*. net, post free.

B.S. 2586 : 1955. Glass Electrodes. Pp. 15. 3*s*. net, post free.

B.S. 2589 : 1955. Railway Track Spanners. Pp. 14. 2*s*. 6*d*. net, post free.

B.S. 2596 : 1955. Components of Crawler Tractors and Earth Moving Equipment. Pp. 17. 4*s*. net, post free.

ABSTRACTS

	PAGE
OILFIELD EXPLORATION AND EXPLOITATION	
Geology	111 A
Geophysics and Geochemical Prospecting	113 A
Drilling	113 A
Production	113 A
Oilfield Development	114 A
TRANSPORT AND STORAGE	114 A
REFINERY OPERATIONS	
Refineries and Auxiliary Refinery Plant	115 A
Solvent Extraction and Dewaxing	116 A
Cracking	116 A
Chemical and Physical Refining	116 A
Special Processes	117 A
Metering and Control	117 A
PRODUCTS	
Chemistry and Physics	117 A
Analysis and Testing	118 A
Crude Oil	119 A
Gas	119 A
Engine Fuels	119 A
Lubricants	119 A
Bitumen, Asphalt, and Tar	120 A
Special Hydrocarbon Products	120 A
Derived Chemical Products	120 A
Coal, Shale, and Peat	121 A
Miscellaneous Products	122 A
CORROSION	122 A
ENGINES AND AUTOMOTIVE EQUIPMENT	123 A
MISCELLANEOUS	123 A
ADDITIONS TO THE LIBRARY	123 A

AUTHOR INDEX

The numbers refer to Abstract Numbers

Alexanian, C. L., 1029
Amstutz, R. W., 1049

Banner, F. H. W., 1091-2
Bardtke, H., 1047
Barret, J. P., 1147
Bennett, H. H., 1150
Bennett, J. F., 1101
Benning, A., 1138
Benz, G. R., 1115
Bradford, R. W., 1106
Brasunas, A de S., 1157
Brien, E. B., 1087
Broaddus, J. E., 1072
Broecker, J. B., 1131
Bruins, P. F., 1132
Buckles, G. L., 1050

Campbell, J. L. P., 1046
Carmine, C. C., 1077
Chalkley, D. E., 1106
Chancellor, J. N., 1086
Chu, J. C., 1076
Cook, H. D., 1098
Corley, W. T., 1061
Corrigan, T. E., 1096-7
Cox, S. B., 1069
Craig, F. F., 1045

DeVoe, W. F., 1115
Duff, B. S., 1136
Duff, D. M., 1054

Earlougher, R. C., 1049
Eden, T. F., 1156
Egloff, G., 1084
Eltenton, G. C., 1090
Ertle, H. J., 1030
Evans, D. J., 1146
Ewers, J., 1141
Eyth, W. S., 1079

Faber, R. L., 1079
Flagg, A. H., 1046
Foxwell, G. E., 1160
Frederick, S. H., 1156
Frey, R. M., 1131
Furby, N. W., 1122

Gardner, F. J., 1036
Geffen, T. M., 1045
Griffith, D. O., 1148
Grigg, R. P., 1032
Grote, H. W., 1088
Guthrie, V. B., 1116

Haensel, V., 1088
Hallfeldt, F., 1080
Harker, R. P., 1112
Harts, H. J., 1064
Harvey, D., 1106
Hazelwood, R. N., 1131
Herrmann, R. H., 1086
Huck, G., 1114
Huntington, R. L., 1072

Ingalls, P. C., 1031

Jäger, A., 1128
Jonas, G.-Z., 1129

Kattwinkel, G., 1128
Kelly, R. G., 1067
Kennedy, F. K., 1066
Kirk, E., 1110
Klinger, R. F., 1026
Kröger, C., 1080
Kyger, W. M., 1154

Larson, C. M., 1119
Lester, C. B., 1058
Loper, B. H., 1083
Lowenstein, J., 1071
Lowy, L., 1135
Lynn, C. V., 1055-6

McArthur, D. S., 1111
McGee, D. A., 1043
McWaters, R. J., 1155
Major, C. J., 1073
Mardock, E. S., 1046
Martin, W. O., 1053
Morse, A. J., 1072
Morse, R. A., 1045
Muendel, C. H., 1108
Miller, H. B., 1130
Munderloh, H., 1100
Myers, J. P., 1046

N.A.C.E. Technical Unit Committee T-1K., 1145
N.A.C.E. Technical Unit Committee T-9D., 1149
Newberg, A. H., 1147
Newitt, D. M., 1060

O'Brien, T. B., 1044
Ocamb, R., 1032
Organick, E. I., 1109
Osborn, R. J., 1095

Pearson, G. H., 1075
Price, W. A., 1027
Price, W. C., 1105
Purdy, G. E., 1153

Rahmes, M. H., 1066
Raifsnider, P. J., 1144
Reay, W. H., 1089
Rick, A. W., 1127
Riss, H. E., Jr., 1098
Ringer, F. W., 1151
Ross, T. K., 1103
Rudge, A. J., 1123

Saimon, R., 1104
Samans, W., 1074
Sanger, R., 1120
Schaafsma, A., 1083
Schiessler, W., 1102
Schildwachter, H., 1158
Schleede, D., 1107
Selke, W. A., 1108
Shepard, A. P., 1155
Shepherd, G. L., 1134
Sherman, P., 1099
Sherwood, P. W., 1133
Sims, G. V., 1052
Sittler, C., 1028
Skelton, J. D., 1041
Smith, R. A., 1059
Sohns, H. W., 1142
Staffel, E. J., 1076
Sterba, M. J., 1088
Sutherland, H., 1102

Tanner, H., 1053
Terres, E., 1139
Terry, J. M., 1046
Thornton, D. P., Jr., 1093
Tracy, G. W., 1048
Treseder, R. S., 1144
Tucker, P. N., 1115

Uhl, W. C., 1078

Voorhees, V., 1082

Wachter, A., 1144
Wallace, P. A., 1033
Ward, T. G., 1050
Watson, M. S., 1050
Weingartner, R. A., 1042
Winzen, W., 1140
Woodhams, R. T., 1132

Yarham, O. L., 1125

OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

1026. Regional subsurface maps reveal the high and low of it. R. F. Klinger. *Oil Gas J.*, 4.4.55, **53** (48), 168.—The use of regional subsurface maps in exploration is briefly outlined. Zones of probability can be located, and these are defined as zones along the axes of cross-folds where only one major unproven structural condition need be verified to form an effective oil trap.

Most parts of the Gulf Coast have been drilled with sufficient density to provide effective regional mapping and reliable forecasting. C. A. F.

1027. A new approach to mapping the continental shelf. W. A. Price. *Oil Gas J.*, 28.3.55, **53** (47), 106.—Methods are described of mapping the continental shelf of the Gulf of Mexico, in order to provide a control for detailed studies of bottom deposits. The method outlines areas of geomorphological contrast and the distribution of sediments by analysis of dynamic environments; the resulting data provide the basic information for more detailed study. C. A. F.

1028. Methods and physico-chemical techniques of preparing sediments for pollen analysis. C. Sittler. *Rev. Inst. franç. Pétrole*, 1955, **10** (2), 103–14.—French palynological literature has hitherto had no detailed account of the preparation of pollens from sediments for study. The present article is based on visits to various European laboratories, and on the author's own lab work. Sample preparation is most important, and the methods must be suited to the sediment and to the final purpose for which the pollen will be used.

Samples of sediment may be gently crushed to 1–2 mm size. Sieving, centrifuging, and flotation may serve to give some separation of mineral and organic matter. Brief notes are given on a wide range of chemical treatments which will effectively remove mineral matter, and some types of organic matter, with little damage to the pollens and spores. Cleaning, staining, and mounting of the pollen material is also

discussed, while there is brief reference to quantitative studies, and a list of chemicals and equipment needed. A bibliography is appended. G. D. H.

1029. Quantitative analysis of minerals in rocks by X-ray diffraction. C. L. Alexanian. *Rev. Inst. franç. Pétrole*, 1955, **10** (2), 115–27.—The use of Norelco X-ray diffraction equipment with a goniometer and Geiger–Muller counter for determining intensities is described. The principle of the quantitative estimation by X-ray diffraction of the crystalline components of a mixture is outlined, and several examples are given. A method used by the author is illustrated by an example using a granite. The percentage of each component is calculable from a relationship involving the intensity of a strong characteristic ray for each component in the mixture and the intensity of the same ray for the pure component, and the coeff of absorption for the entire mixture and the mass absorption. The last factor can be determined by supplementary measurements which involve the addition of a known amount of a given crystalline substance to the mixture.

The method gives good figures for the amounts of a component accounting for 10% or more of the total; it is less satisfactory for amounts between 5% and 10%, and poor below 5%. Reproducibility depends on the stability of the instrument, and on the fineness of the powder used in preparing the mount for the measurements. Ideally the max grain size should be 5 μ.

The method is of use in the aluminium and ceramic industries. G. D. H.

1030. Modern views on the genesis of coal from the constituents in veins and strata. H. J. Ertle. *Erdöl. u. Kohle*, 1954, **7** (12), 805.—A discussion of the results of researches on the modes of formation of coal, including brown coal, carried out by Mackowsky, Teichmüller, and von Karmasin. The subject is still rather problematical and suggestions are made for further investigation. It is suggested that a study should be made of the peat inclusions in the coal which might account for the differences in structure of the strata. Investigation of the profile by means of polished sections taken at each cm depth should give useful information. W. W. G.

1031. Oil in the bank—a look at and appraisal of active undeveloped petroleum provinces. P. C. Ingalls. *Oil Gas J.*, 4.4.55, **50** (48), 122.—New field and deeper-pool discoveries in the U.S.A. and Canada in 1954 are described in relation to undeveloped provinces which may provide significant oil- and gas-producing areas in the future, as follows: Gulf of Mexico, E. Texas and Mississippi, Anadarko basin, S. Permian basin, S. Rockies, Wyoming, Williston basin, and W. Canada. C. A. F.

1032. Lewisburg typifies South Louisiana multiple-pay fields. R. Ocamb and R. P. Grigg. *Oil Gas J.*, 17.1.55, **53** (37), 100.—The geology of the Lewisburg field, 15 miles NW. of Lafayette, Louisiana, is described. The field was discovered on a seismic anomaly in 1941, and the structure is a N.–S.-trending ridge cut by several E.–W. faults; uplift is probably due to deep-seated salt movement, and there is evidence of increasing closure with depth. Faulting is normal, downthrown to the S. with decreasing throw upwards, and the development of reverse dip into the faults due to contemporaneous faulting and deposition can be recognized.

The sequence ranges from Pleistocene to Oligocene, and there are 8 sand pays (Oligocene–Frio), all of which, except one, produce gas condensate. Several middle Frio sands in the S. fault block have not yet been produced.

Characteristics of the pays are outlined, and a cross-section and structural maps are included. C. A. F.

1033. Chikasha; a tired gas field yields oil. P. A. Wallace. *Oil Gas J.*, 17.1.55, **53** (37), 154.—The Chikasha gas field, Grady County, Oklahoma, was discovered in 1922, and gas production was developed from Permian and Pennsylvanian sands. Since March 1954 oil has been produced from Permian sands at 3000–3500 ft, and over 100 new wells have been completed.

The field is in the Anadarko basin, and the structure consists of a steeply dipping Pennsylvanian anticline, plunging to the S. and faulted along the E. side, overlain unconformably by Permian.

Pays consist of lower Permian sand lenses with a porosity of 18–26% where the sands are well developed. Accumulations are part structural and part stratigraphic. C. A. F.

1034. Record hole dry. Anon. *Oil Gas J.*, 17.5.55, **53** (37), 72.—The world's deepest well, Ohio K.C.L-A in the Paloma field, California, has been abandoned as dry at 21,482 ft. After the recovery of stuck pipe from 12,000 to 17,300 ft prospective pays were tested, some of which had shows, but none were commercial. C. A. F.

1035. Drilling steps up. Anon. *Oil Gas J.*, 28.3.55, **53** (47), 96.—Oil has been found at Westward Ho in SW. Alberta; the discovery well was completed for 1002 b.d. of 35·2° oil from Mississippian at 8755–8774 ft, and plans for development have been made. Another well, 1 Sundre, 7 miles NW. of Westward Ho, has also found Mississippian production, flowing 2808 b.d. of 31·5° oil. C. A. F.

1036. Westward Ho–Canadian style. F. J. Gardner. *Oil Gas J.*, 28.3.55, **53** (47), 175.—The discovery of the Pembina field in W. Alberta has stimulated exploration in this W. area; promising prospects include Cardium sand pay, reefs, and overthrust traps along the E. edge of the Canadian Rockies, and there is intensive drilling and geophysical work. About $\frac{1}{4}$ of the wildcats in Alberta are now drilling in this area, which has produced some of the best discoveries in recent years. New reservoirs in formations not previously thought productive include granite wash, deep D_3 reefs, Trias dolomites, and the Cardium; and new Mississippian discoveries are also of great importance. C. A. F.

1037. Brazil finds more oil. Anon. *Oil Gas J.*, 28.3.55, **53** (47), 100.—Oil has been found in the Amazon basin *ca* 100 miles SE. of Manaos on the Madeira river; on test the discovery flowed 600 b.d. of 40°–50° oil from the Devonian at 8910 ft. The well was located on seismic evidence which indicated a large anticline.

This is the first discovery in Brazil outside the Bahia coastal fields, and is *ca* 1000 miles from nearest production. C. A. F.

1038. Arab Zone dry. Anon. *Oil Gas J.*, 28.3.55, **53** (47), 101.—A deep test has been drilled in the Wafra field of the Kuwait–Saudi Arabia Neutral Zone; pay was discovered in the Ratawi limestone below 6500 ft, but the Arab Zone was dry.

15 producers have been completed in the Wafra Middle Cretaceous zone at *ca* 3500 ft; a wildcat S. of Wafra at Shadhaf found this zone dry.

Production in December from Wafra was *ca* 24,000 b.d., and a new terminal has been constructed at Ras Az Zor on the coast. C. A. F.

1039. Egyptian well hits. Anon. *Oil Gas J.*, 17.1.55, **53** (37), 77.—A new field has been found on the Sinai Peninsula, Egypt. The discovery, Belayim, 16 miles S. of Wadi Feiran, on test flowed 2170 b.d. from 7300 ft. Pay is Eocene, *ca* 1000 ft deeper than pays producing at Wadi Feiran. C. A. F.

1040. Desert wildcat. Anon. *Oil Gas J.*, 28.3.55, **53** (47), 99.—A wildcat is to be drilled in the Western Desert of Egypt, 28 miles SW. of Alexandria; seismic and geological work are to be carried out in the concession, which covers 50 million acres between the Nile and the Libyan border.

A field has been found this year at Belayim in the S. part of the Sinai Peninsula; and the discovery well flowed approx 1150 b.d. from 7350 ft in Miocene. C. A. F.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

1041. Geophysical-type magnetic tape recorders. J. D. Skelton. *Oil Gas J.*, 4.4.55, **53** (48), 176.—Magnetic tape recording equipment, specially constructed for geophysical work, has recently been manufactured and made available to the industry. 7 different types of recorder are described and compared; the purpose of the equipment is to record seismic data in the field which can later be played back and analysed. C. A. F.

1042. Hastings field. Brazoria and Galveston Counties, Texas. R. A. Weingartner. *Oil Gas J.*, 4.4.55, **53** (48), 190.—The geophysical case history of the Hastings field, Texas, is described. The field is situated on the Gulf Coast Plain, and no structure can be mapped at surface; it was discovered by drilling on a gravity anomaly which had been checked by reflection shooting.

The gravity and seismic maps are given, and the present productive area is shown in relation to the seismic anomaly.

The field was discovered in 1934, and 643 wells have been completed in a producing area of 5600 acres. C. A. F.

DRILLING

1043. Economics of offshore drilling point to need for more drilling units. Pt. 2. D. A. McGee. *Oil Forum*, 1955, **9** (2), 52.—Details are given of methods for offshore drilling and production, including the handling of the crude oil, gas, and condensate produced. A comparison is made of the total investment required and also the costs of the various operations involved in the different methods used for offshore drilling and production.

As a result of the high fixed costs due to the nature of offshore operations, the producing costs are far in excess of those on land until the daily production in any field reaches 1560–4000 b.d., depending on the area. When producing at this rate, the offshore costs are *ca* 50–80 cents/brl, compared with the land costs of 30–40 cents/brl. It is, therefore, important to keep the production volume as high as possible in each field.

In view of the pioneering aspect of offshore operations, the methods and equipment that have been evolved to date are giving reasonably economic results. W. W. G.

1044. Sea-water mud makes good drilling fluid. T. B. O'Brien. *Oil Gas J.*, 28.3.55, **53** (47), 118.—The successful use of sea-water mud in the Timbalier Bay field, Louisiana, is described; the mud was introduced because of difficulty in fresh water supplies. Advantages of the salt-water mud include lower cost, and a tendency to prevent hydration of clays and therefore a reduction in mud-making. 2 types of mud have been used; a sea-water lime-treated mud and a low-solids sea-water mud treated with CMC, caustic soda, and an organic thinner. C. A. F.

PRODUCTION

1045. Oil recovery performance of pattern gas or water injection operations from model tests. F. F. Craig, T. M. Geffen, and R. A. Morse. *J. Petrol. Tech.*, 1955, **7** (1), AIMME Tech. Paper No. 3981, 7–13.—Lab model tests of water and gas injection tests are described, in which X-ray shadowgraphs are used to observe gross fluid movements in consolidated sandstone blocks, 4 inches square and $\frac{3}{4}$ inch thick. The model was scaled to reproduce field performance, with the block as a quadrant of a 5-spot pattern.

The results of the experiments are described and discussed. A method has been developed for applying the mobility ratio concept to water-flooding and gas drives. It seems that the areal sweep efficiency of 50–100% is much higher than previously considered. Buckley and Leverett's frontal drive equation can be modified to predict the oil recovery by water flood or dispersed gas drive for an idealized system, if appropriate rock and fluid characteristics are used in conjunction with experimentally determined correlations.

An appendix sets out the method of calculating field performance for 5-spot water or gas injection. G. D. H.

1046. Radio-active tracers in oil production problems. A. H. Flagg, J. P. Myers, J. L. P. Campbell, J. M. Terry, and E. S. Mardock. *J. Petrol. Tech.*, 1955, **7** (1), AIMME Tech. Paper No 3982, 1–6.—3 techniques seemed feasible for using radio-active tracers to locate permeable zones in formations: (1) soluble inert isotopes which are pumped into the formations; (2) soluble chemically-active isotopes which react with the fluids and materials in the porous zones; (3) radio-active particles which are filtered out on the well face of permeable beds. (1) and (2) had disadvantages; (3) required the hole to be free of mud and mud cake, flow down the well at a rate greater than the falling velocities of the particles, fairly large particles, and radio-active material which remained on the carrier particle.

Safety precautions in using radio-active materials are briefly described.

Radio-active iodine has been incorporated in resin particles, and used for obtaining water flood injection profiles and oil-injection profiles. Oil-injection profiles may be used in checking the effectiveness of fracture treatment. Gas-injection profiles were obtained by means of an oil-soluble gas using iodine 131 as the radio-active material.

Addition of radio-active material to sand used in fracture treatments can reveal zones of fracture (usually it is added only to the final part of the sand). When tracers are added to cement the location of squeezed cement can be determined, and also the top of cement (in this case the tracer is in the first few sacks of cement). Points of lost circulation or casing leaks are detectable by using radio-active tracers. G. D. H.

1047. New measuring methods for the investigation of formation conditions. H. Bardtke. *Erdöl u. Kohle*, 1954, **7** (12), 807.—The planning of production from oil wells is based on the situation found in the formation and, therefore, careful measurements should be taken daily of the conditions in the well. Recently developed apparatus is described for taking samples, and for measuring the humidity, pressure, and temp of the well at different levels. W. W. G.

1048. Simplified form of the material balance equation. G. W. Tracy. *J. Petrol. Tech.*, 1955, **7** (1), 53–6.—The simplified form of the material balance equation.

$$N = \frac{n\left(\frac{\beta}{\alpha} - S\right) + G - \frac{1}{\alpha}(W - w)}{\left(\frac{\beta}{\alpha} - S\right) - \left(\frac{\beta_0}{\alpha} - S_0\right) + M\beta_0\left(\frac{1}{\alpha_0} - \frac{1}{\alpha}\right)}$$

is reduced to $N = n\phi_n + G\phi_g - (W-w)\phi_w$ by placing each of the 3 group terms of the numerator over the denominator, and then developing the factors ϕ_n, ϕ_g, and ϕ_w, which are pressure factors, and derivable from bottom-fluid analyses and the initial ratio of gas cap and oil vol. Curves of ϕ_n, ϕ_g, and ϕ_w plotted against reservoir pressure can be drawn. All the curves are at infinity at the bubble-point pressure, and change rapidly in value just below that pressure, so that their use is not reliable under such conditions. Where the slopes of the various pressure factors are small the use of the material balance equation is more satisfactory. When the plots are available oil-in-place can be calculated quickly when the average pressure and production data are available.

The amplified equation can be further modified to simplify performance calculations in the case of no water influx or water production, and an example of the use of this modification is given. The oil-in-place is also calculated. G. D. H.

1049. Water source and requirements. R. C. Earlougher and R. W. Amstutz. *J. Petrol. Tech.*, 1955, **7** (1), 18–20.—Max daily water requirements arise during the fill-up period, and may be twice that needed later, but this may be modified

by the progressive development of the flood acreage. Experience suggests 1–2 b.d/acre-ft during fill-up. Normally increased oil production is noted in 6–9 months. After fill-up the injection rate is ½–1 b.d/acre-ft. Water requirements will be much higher when a depleted reservoir has a gas sand at the top; the latter must be water-filled to exclude oil loss. In pressure maintenance water injection should be twice the oil rate, and preferably ½–¾ b.d/acre-ft.

In the total flood life water needed may be 150–170% of total pore space (including any adjacent gas sand).

As the flood progresses recycled water increases as a fraction of the daily input. Recycling should be done unless treatment costs exceed the cost of make-up waters.

Surface waters are unreliable in quality and quantity, and costly to treat. Many water floods are operated on water from alluvium. The supply is rather more reliable, and it is cheap and easy to handle. Good fresh water is often available down to 1000 ft or more. Pumping may be necessary, and treating may not be needed. Shallow salt water may be suitable for closed systems. In [illegible] cases sea water can be used.

Recycled water may be 30–60% of the total requirements. Careful analysis may prevent mixing, which could cause objectionable precipitates.

If conditions are favourable a closed system is preferable to an open system, and sub-surface salt waters are preferred to fresh waters for make-up. G. D. H.

1050. Well completions for water flood operations. M. S. Watson, T. G. Ward, and G. L. Buckles. *J. Petrol. Tech.*, 1955, **7** (1), 21–4.—In the Permian sand fields of W. Texas there are upper water-bearing formations, producing sand lenses separated by shale, sandy shale, and dolomite stringers. The oil sands are overlain by gas sands, while in some cases there is water down-dip.

Open-hole producing completions have proved most satisfactory in the water floods. This permits easy access for cleaning out. Calcium sulphate scaling and some fine sand production are common. So far as possible cable tools are used throughout. The upper water sands are cemented off behind 10¾-inch casing. The Yates formation (producing zone) is chip-cored in the section to be flooded, to find fluid contacts. The entire pay section is shot before running 5½-inch casing. 2-inch tubing is run to bottom in the case of injection wells, but for producing wells a pumping string of tubing is run.

In converting oil producing wells, a liner is set to the top of the producing zone, and then tubing is run to bottom, being packed off at the top of the casing for input wells and left open in producing wells. G. D. H.

1051. Letter symbols for reservoir engineering. Anon. *J. Petrol. Tech.*, 1955, **5** (1), 38–9.—A series of symbols is listed for use in mathematical expressions. The definition and dimensions are given, and there is a statement on typography, covering both the symbols and any numerals, subscripts, superscripts, etc. G. D. H.

OILFIELD DEVELOPMENT

1052. Some impressions of Western Canada. G. V. Sims. *Brit. Petrol. Equipm. News*, 1955, **4** (4), 34–7.—In reference to the Canadian oil industry, it is stated that hardly any companies operate at a satisfactory profit level. Vast development of oil resources continues, however, with an eye to the future. E. A. G. H.

1053. Colombia's Velasquez field grows steadily. H. Tanner and W. O. Martin. *Oil Gas J.*, 14.3.55, **53** (45), 123.—The development of the Velasquez field in the middle Magdalena Valley of Colombia is outlined.

The discovery well, located on seismic data, was completed in 1946 with an initial production of 422 b.d., and 71 wells have been drilled to date in an area which is accessible only by air and river. Cumulative production is 5·4 million brl, 3300 acres proven productive; the N. and S. limits are undefined.

Production comes from sand lenses which are alternately oil and water bearing from 4150 to 8450 ft in depth. Crude is 18°–29° and permeability varies from 10–1000 mD.

Drilling and production practice are outlined. C. A. F.

1054. Red production shifting. D. M. Duff. *Oil Gas J.*, 17.1.55, **53** (37), 77.—Current trends indicate that the Bashkir region between the Volga and the Ural mountains will become the main source of Russian oil during the next few years; 1954 production for the area is reported to be 20% higher than 1952, and current production is *ca* 300,000 b.d., or *ca* 26% of Russia's total output. Baku is believed to be producing *ca* 350,000 b.d.

Recent discoveries in Bashkir are reported to be in deep Devonian formations.

Production is also reported from the Stalingrad area, and between Moscow and Leningrad. C. A. F.

TRANSPORT AND STORAGE

1055. Rising costs of oil storage tanks. C. V. Lynn. *Oil Gas J.*, 11.4.55, **53** (49), 111.—This is Pt 2 of the article on costs of tankage, and deals with drains, gauges, venting, flame arrestors, clean-out, water draw-off, and maintenance, which latter includes painting and inspection. A chart for computing retirement time is given. G. A. C.

1056. Protect your tank investments. C. V. Lynn. *Petrol. Process.*, 1955, **10** (3), 361–5.—Sinclair Refining Co has 26 million brl of gross storage capacity consisting of 2 main classifications of tanks, cone roof and floating roof. In order to safeguard yearly charges as well as initial investment, they have laid down a protection formula comprising the selection of the best possible design and type of tanks, including accessories, the payment of close attention to tank foundations and the following of careful erection procedures, the provision of adequate maintenance, including painting, regular inspection, and keeping thorough records on corrosion, and the removal of tanks from service at the end of their optimum useful life. J. H.

1057. Tankers and world shipping: the position at end-1954. Anon. *Petrol. Times*, 15.4.55, **59** (1505), 371.—Brief digest of "Lloyds Register of Shipping, Annual Report 1954," including statistics on gross world fleet tonnage, and on world tanker fleets. C. B.

1058. Hydraulics for pipeliners. Pt VIII. C. B. Lester. *Pipe Line News*, 1955, **27** (3), 26–33.—Hydraulic circuits and electrical analogs are considered and simple graphical solutions given. B. A. F.

1059. Flow of sand–water slurries in horizontal pipes. R. A. Smith. *Fluid Handl.*, April 1955, (63), 97.—Slurries containing different concn of sand of various size-gradings were pumped in 2- and 3-inch lines. Pressure drops and settling velocities were determined, and comparisons made with published correlations which showed a need for small scale tests for accurate work. The characteristic curves for a centrifugal pump used in the work were determined. D. J. S.

1060. Hydraulic conveying of solids in a horizontal pipe. D. M. Newitt *et al.* *Fluid Handl.*, April 1955, (63), 107.—An abstract of a paper is given in which data obtained with a variety of materials in one-inch pipe were correlated by theoretical equations. Conclusions of both practical and theoretical significance were drawn to enable a unified picture of transport phenomena to be obtained. D. J. S.

1061. Pipelining through Louisiana's marshes. W. T. Corley. *Oil Gas J.*, 25.4.55, **53** (51), 148.—The problems encountered by Interstate Oil Pipeline Co in adding 25 miles of 8- and 12-inch line to extend its system to the edge of the Gulf of Mexico are outlined, and solutions which were developed to meet them are given. G. A. C.

1062. Construction of the Sui-Karachi gas pipeline. Pt I. Anon. *Fluid Handl.*, April 1955, (63), 93.—A line has been laid to convey natural gas from Baluchistan to Karachi, a distance of 350 miles. The line is all welded seamless 16-inch steel pipe. Details are given of contracts, routes, the construction of the pipe, and the method of threading the Lloyd Barrage at Sukkur. D. J. S.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

1063. Mantova refinery. Anon. *Brit. Petrol. Equipm. News*, 1955, **4** (4), 41–4.—This refinery owned by I.C.I.P. in Italy is described in detail with relation to process flow. A wide range of crude is processed in 3 principal stages: (1) an atmospheric dist unit combined with a thermal cracking and visbreaking unit; (2) a cat desulphurizing and reforming unit combined with a gas recovery and stabilization unit; (3) a chemical treating unit for finished gasoline and kerosine. Data and many details relating to plant and aux equipment are stated. E. A. G. H.

1064. Try cascade controls. H. J. Hartz. *Petrol. Process.*, 1955, **10** (4), 511–15.—Cascade control columns are coming into greater use every day with the trend toward automatic operation in refineries and other process industries. Factors which have emphasized the need for more complex controls of the cascade type are closer process variable regulation and the complexity of new processes. Cascade control is one in which 2 or more variables are interlocked in a single control loop. The article deals mainly with the application of this type of control. J. H.

1065. Three new separation methods. Anon. *Petrol. Process.*, 1955, **10** (2), 229–33.—3 new developments for separating petrochemicals from process streams were disclosed at the recent 47th Annual Meeting of the American Institute of Chemical Engineers in New York City. Fluid Char Adsorption—by the Standard Oil Development Co—has graduated from the pilot plant stage with successful separations of light hydrocarbon gases usually requiring high pressures and refrigeration equipment, and is being made available for commercial use. The Rotating Disk Contactor—developed by the Shell Oil Co for liq–liq extractions—is already in commercial use, replacing packed towers and mixer–settler systems. Use of liq ammonia for solvent extraction—while yet in the pilot plant stage at Pennsylvania State University—shows promise as a useful aux method for separating aromatics and unsaturates from complex mixtures. J. H.

1066. How's your absorber efficiency? F. K. Kennedy, J. N. Chancellor, and M. H. Rahmes. *Oil Gas J.*, 18.4.55, **53** (50), 133.—A series of tests at Stanolind Oil and Gas Co's Hastings gasoline plant show that the number of theoretical plates does not increase proportionately with an increase in actual trays in the 20–40 tray range. There is a significant trend towards lower tray efficiencies as volatility increases from butanes through to methane. G. A. C.

1067. Perforated plates versus bubble caps in absorber service. R. G. Kelly. *Oil Gas J.*, 18.4.55, **53** (50), 128.—A series of plant tests have been carried out at Humble Oil and Refinery Co's Baytown refinery to compare plates and bubble-caps in absorbers. Results show that capacity and efficiency characteristics with perforated trays are good, and that they have good fouling characteristics in relatively clean service. The perforated-tray installation in one absorber had substantially more capacity than the original bubble-cap type. Perforated tray design is easier than for bubble-cap trays of same flexibility. Test data are given. G. A. C.

1068. Unit operations and fundamentals review. Various. *Industr. Engng Chem.*, 1955, **47** (3), 502–670.—This year the review includes a section on high temp dist (pp. 524–6) as well as the usual comprehensive reviews of work published in the last 2 years on unit operations and fundamentals. B. A. F.

1069. Cut pump specification work with standard data sheet. S. R. Cox. *Chem. Engng*, 1955, **62** (4), 171.—A standard card for use in pump systems is described. The final requirements are found logically, and also selection of pump is simpler and quicker. Details of service and load are included for future reference. D. J. S.

1070. Short cut to plant start-up. Anon. *Chem. Engng*, 1955, **62** (4), 122.—An "erector-set" which is claimed to reduce the time for plant lay-out 30% and cost 40% has been introduced. Models are set up and the final form photographed with cards carrying dimensions. The lay-outs are easily changed as fabrication proceeds, should design changes be needed. D. J. S.

1071. For fast estimates of fluidization velocities. J. Lowenstein. *Chem. Engng*, 1955, **62** (4), 189.—During the preliminary design of fluidization equipment it is often impossible to predict the fluid velocities. Graphical methods are presented which give approx soln based on empirical relations. The procedure is described and an example is given. D. J. S.

1072. How to drain bubble-cap columns. J. E. Broaddus, A. J. Morse, and R. L. Huntington. *Petrol. Engr*, 1955, **27** (2), C38–40.—As a result of investigations a correlation is given between size of weep hole, riser ht, and number of plates and drainage time. Liq properties are also taken into account. J. B. S.

1073. Charts for pressure vessel design. C. J. Major. *Chem. Engng*, 1955, **62** (4), 172.—Nomographs based on the 1952 ASME Code for Unfired Pressure Vessel Design are given which eliminate trial and error methods for the 4 major categories of pressure and vacuum vessels. Thickness may be found or alternatively max allowable thickness for a given pressure. Examples of the use of the nomographs are given and discussed. D. J. S.

1074. Keep those pressure vessels safe. W. Samans. *Petrol. Process.*, 1955, **10** (4), 502–4.—This begins a series of 4 authoritative articles on how to maintain safe operation of unfired pressure vessels. Pt I, contained in this article, outlines organization and scheduling. J. H.

1075. The design of balanced stop valves—III. G. H. Pearson. *Fluid Handl*, Apr. 1955, (63), 101.—In the final article of a series the practical points in the operation of balanced valves are discussed. A further article on piston-type throttle valves is to follow. D. J. S.

1076. Correlation between equilibrium flash vaporization and ASTM distillation data of petroleum mixtures. J. C. Chu and E. J. Staffel. *J. Inst. Petrol.*, March 1955, **41** (375), 92.—Correlation between equilibrium flash vaporization (EFV) and ASTM dist data has frequently been used as a tool in the design and performance prediction of petroleum processing equipment; existing correlations have been investigated and an improved one developed. The data recently con-

tributed by 9 major oil companies have constituted the bulk of data compilation for 151 systems. Only 65 sets of data were used in developing the correlation; the remaining sets are either incomplete or eliminated because of indication of cracking during dist. Starting with the atmospheric ASTM curve, several variables were investigated, and the correlation finally developed consists of an improved method in predicting the 50% EFV from 50% ASTM point with characterization factor, and 10–70% ASTM slope as additional variables. The correlation was checked with additional experimental data. For the 50% correlation the arithmetic average error is −12·5° F and mean deviation ±13·5° F, representing an improvement over existing methods of 40–110%. Improvement at other points is of similar order. 37 literature refs are included. U. M.

1077. Maintenance dividends for you. C. C. Carmine. *Petrol. Process.*, 1955, **10** (2), 192–7.—At its 100,000 b.d., Avon, California, U.S.A., refinery, Tide Water Associated Oil Co has solved the problem of preserving balance maintenance work requirements and man-power by adding planning and scheduling to the execution function in their maintenance and construction department allowing maintenance personnel to be gainfully employed between peak loads or authorized new construction, alterations, dismantlements, and large maintenance jobs. A complete review is given concerning the new scheme, and numerous charts are included showing the decrease in maintenance and repair costs, organization, etc., and specimen working forms are reproduced. J. H.

1078. Why a computer for refining? W. C. Uhl. *Petrol. Process.*, 1955, **10** (2), 189–91.—Man-hours wasted on decisions of considerable economic weight can be eliminated by means of an electronic digital computer such as that installed by Socony-Vacuum Oil Co at Paulsboro, N.J., U.S.A., costing $135,000. The computer can handle a problem taking an experienced refinery engineer 2 weeks to solve in 15 minutes. Its applications and advantages are reviewed, both by itself and when in combination with a mass spectrometer. It is favoured to the analog computer, since it has wider and more flexible applications. J. H.

1079. Take a look at electric heaters. W. S. Eyth and R. L. Faber. *Chem. Engng*, 1955, **62** (4), 191.—Many sizes and ratings of electric heaters can be devised from 4 basic resistance heating units. The selection of types is discussed, and the use of jacketed kettles with electrically-heated heat-transfer media is mentioned. The advantages of electric heating are discussed. D. J. S.

SOLVENT EXTRACTION AND DEWAXING

1080. The production of individual *n*-paraffins from high-boiling paraffin-base gas oils. C. Kröger and F. Hallfeldt. *Erdöl u. Kohle*, 1954, **7** (12), 811.—The heavy gas oil fraction of Aramco crude oil was used as a base for the production of each of the paraffin hydrocarbon homologues nonadecane $C_{19}H_{40}$ to tetracosane $C_{24}H_{50}$ inclusive. The separation was carried out by solvent dewaxing of the gas oil fraction using dichlorethylene–methyl alcohol and also dewaxing by urea-adduct precipitation. In each case the factors of concn and temp were studied, and full details of the results were tabulated. It was found that the urea-adduct precipitation method gave better and more reproducible separation than the solvent dewaxing process used. By means of chromatographic methods, the final separation of the individual paraffin hydrocarbons was obtained. W. W. G.

1081. Low cost, heat efficiency. Anon. *Chem. Engng*, 1955, **62** (4), 132.—The rotating disk contactor in liq–liq extraction saves 50% of cost of mixer–settler unit in one application, and has many other advantages. The contactor has low H.E.T.S., high capacity, and good flexibility, controlled by shaft speeds. The principle of operation depends on a shaft carrying rotating disks, set in a column with fixed stator rings. Details of the effect of operating variables are given. D. J. S.

CRACKING

1082. Catalytic processes occupy crucial position. V. Voorhees. *Petrol. Engr*, 1955, **27** (3), C26–32.—Demand is increasing for premium grade gasoline and for higher octane rating. Developments have been made in both cat cracking and reforming plant, more processes now using platinum cat. A short description is given of most reforming processes, with particular reference to recent developments. J. B. S.

1083. Have you tried high-alumina catalyst? B. H. Loper. *Oil Gas J.*, 25.4.55, **53** (51), 107.—The advantages of high alumina cat are discussed. Those included are greater activity stability, improved cracking selectivity for the 25% alumina cat, lower temp operation, and lower stack loss. G. A. C.

1084. The Platforming process. G. Egloff. *J. Inst. Petrol.*, March 1955, **41** (375), 69.—Full report of paper including discussion (*cf* Abs. **412**, 1955). U. M.

CHEMICAL AND PHYSICAL REFINING

1085. Desulphurizing middle distillate fractions. A. Schaafsma. *Erdöl u. Kohle*, 1954, **7** (12), 817.—Gas oil obtained from the cat cracking plants charged with Middle East dist tends to have a high sulphur content owing to the concn of sulphur compounds in the oil circulated during the cracking process. Various means can be used to overcome the disadvantages of high sulphur content of the fuel during engine operation.

The different methods of reducing the sulphur content of gas oil fractions are described under 2 categories: (1) removal of the sulphur containing mol as such; or (2) removal of the sulphur atoms by chemical reaction. In (1) is included extraction processes using selective solvents such as furfural and liq SO_2 which remove the sulphur compounds present as cyclic compounds in similar fashion to the solvent extraction of aromatic compounds.

Mention is made of HF as a good selective solvent for sulphur compounds, good results being obtained with low solvent ratios. A serious disadvantage of desulphurization by solvent extraction is the accumulation of high sulphur extracts for which there is no ready market outlet.

Under (2) are described processes involving hydrogenation, such as the Autofining process of the British Petroleum Co, which makes use of a cat based on cobalt and molybdenum on aluminium oxides. The operating conditions are: 400°–425° C, pressure 5–15 atm, flow velocity of gases 1–5 vol/vol cat/hr, gas circulation 400 m^3/ton.

Another process described is the "Shell" desulphurization or "trickle" process. A cheap cat is used consisting of 0·8 pts by wt of cobalt, 6·5 pts of molybdenum, and 100 pts of bauxite as the carrier. The cat is mechanically robust and very efficient, 35–50% of the theoretical quantity of hydrogen for saturation being used. The operating conditions are: temp 350°–400° C, pressure up to 50 atm. Under these conditions the gas oil fraction is not wholly vaporized but flows as a film over the cat—hence the term "trickle" applied to the process. The amount of gas mixture circulated is only *ca* 100–250 m^3/ton compared with 1000 to 2000 m^3/ton used in vapour phase processes. Thus compressor capacity and heat exchange surface are considerably reduced.

The cost of hydrogen for these desulphurization processes is comparatively low, as a possible source of the gas is found in the cat reforming plants. W. W. G.

1086. Silica gel proves good drying agent. R. H. Herrmann. *Oil Gas J.*, 18.4.55, **53** (50), 44.—Granular silica gel for natural gas dehydration has been tried in a Carthage gasoline plant. Results show that silica gel has high activity and long useful life under severe operating conditions, is suitable for dehydration at relatively high temp, and is resistant to fouling and to particle breakdown. G. A. C.

1087. Molecular "sieves" offer new separation process. E. B. Brien. *Petrol. Engr*, 1955, **27** (3), C35–6.—Synthetic zeolites can be used to separate mol of liq or gases according to size. The mixed stream is passed through a packed column of the zeolite, and the mol in the stream that are small enough to enter the openings in the absorbent are held there, the remainder passing up the column. These zeolites can separate ethane–propane mixtures and straight-chain hydrocarbons from branch-chained and cyclic. Reactivation is by heating and purging. J. B. S.

SPECIAL PROCESSES

1088. Try Rexforming for 100. H. W. Grote, V. Haensel, and M. J. Sterba. *Petrol. Process.*, 1955, **10** (4), 495–8.—Rexforming, a new process development by Universal Oil Products Co, is aimed at the production of high octane motor fuels. O.N. (F-1 clear) in excess of 100 have been produced in lab test runs using mid-continent feed stocks and low, naphthene feeds. It is essentially a combination process: integrating feed prefractionation, reaction section proper, a stabilizer, and solvent extraction coupled with a recycle of low octane materials. The low octane components do not appear in the finished Rexformate, which is a water white gasoline, of controlled volatility characteristics. Due to the mild process conditions, side reactions are minimized, cat life is extended, and overall yields are high at high-octane levels. J. H.

1089. Some recent developments and future prospects in the petroleum chemicals industry. Pt III. W. H. Reay. *Petrol. Times*, 18.3.55, **59** (1503), 279.—This is the final part of the review and concerns plastics and synthetic fibres derived from petroleum, examples of which are polyethylene and terylene, the manufacture of which are dealt with. G. A. C.

METERING AND CONTROL

1090. Quality control instrumentation—the petroleum industry's requirements. Pt II. G. C. Eltenton. *Brit. Petrol. Equipm. News*, 1955, **4** (4), 49–52.—This further article deals first with the continuous measuring viscometer based on the parameter of viscous drag. Continuous fl. pt. and colour recorders are also mentioned, with special regard to their intrinsic defects. A further indication of the quality of petroleum products is indirectly given by measurements of dielectric constants. These latter instruments require special ambient temp compensation, and generally very sensitive bridge circuits. E. A. G. H.

1091. Instrumentation and automatic control in oil refineries. Pt IV. Installations. E. H. W. Banner. *Petroleum, Lond.*, 1955, **18** (4), 121–5.—Various control installations are briefly described showing how some of the control panels are arranged so that uses of various instruments can be appreciated. Examples of "mimic" and "graphic" panels in use are given, and instruments special to certain refineries are described in detail. J. B. S.

1092. Instrumentation and automatic control in oil refineries. Pt V. Electrical systems. E. H. W. Banner. *Petroleum, Lond.*, 1955, **18** (5), 170–5.—Although detection and control are electrical, valve actuation is by pneumatic means. In the "Evershed" system described, 0–30 milliamp D.C. corresponds to the normal 3–15 p.s.i. By the use of multi-core cables compact panels of small instruments can be used. Temp measurement is by thermocouple, which feeds a moving coil galvanometer. By means of photocells and an electronic valve, an output in the 0–30 milliamp range is obtained which is passed to the controller. Pressure, flow, and level transmitters all employ an electromagnetic arrangement, the small mechanical movement being transferred to a coil mounted on a spindle. The electrical precise tank gauge is also described. J. B. S.

1093. Are process analyzers for you? D. P. Thornton, Jr. *Petrol. Process.*, 1955, **10** (2), 204–10.—2 analytical-type control instruments have been developed by Phillips Petroleum Co for automatic process control or indicating or recording applications following several years of experimentation and successful plant trials. Both are now in routine use at several of the company's plants. They are now available to industry generally. One is an infra-red analyser of high sensitivity, stability, and rugged construction. The other is a differential refractometer, equally rugged. The accuracies of these 2 instruments, in the plant, is high and comparable to the accuracy obtained from similar lab equipment. Applications and details are cited. J. H.

1094. Infra-red analysers reduce *iso*butane losses. Anon. *Oil Gas J.*, 11.4.55, **53** (49), 120.—The use is described of infra-red analysers in the alkylation units of the Standard Oil Co (Ohio) at Toledo. The analyser is installed in the debutanizer overhead line to monitor the *iso*butane concn at this point, and from the record the operator adjusts ratios of *iso*butane–butylene feed to the units, to reduce *iso*butane losses. Maintenance is an important factor in efficient operation. G. A. C.

1095. How instruments run to-day's pipelines. R. J. Osborn. *Oil Gas J.*, 11.4.55, **53** (49), 115.—All phases of pipeline instrumentation from the Bourdon gauge to batch detectors are reviewed, and descriptions given of several types of up-to-date pipeline measuring schemes, with advantages and disadvantages of each type. G. A. C.

PRODUCTS

CHEMISTRY AND PHYSICS

1096. Chemical engineering fundamentals. Catalytic vapour phase reactions—III. T. E. Corrigan. *Chem. Engng*, 1955, **62** (3), 197.—In many cases kinetic data are expressed by the use of rate equations that are entirely empirical. Some empirical methods are discussed, including the use of empirical "dirt factor" as an added term in the rate equation. Methods of expressing cat data are presented, and methods of obtaining experimental kinetic data are discussed. D. J. S.

1097. Chemical engineering fundamentals: interpretation of kinetic data—I. T. E. Corrigan. *Chem. Engng*, 1955, **62** (4), 199.—Precautions in obtaining kinetic data are discussed, and the methods of checking are given. Having obtained the data, the analysis of it is described; the use of initial rates in finding the controlling mechanism is discussed. The limitations on the uses of initial rates in finding the rate constants or mechanism are given. D. J. S.

1098. Monomolecular films of mixtures—I. Stearic acid with *iso*stearic acid and with tri-*p*-cresyl phosphate. Comparison of components with octadecylphosphonic acid and with tri-*o*-xenyl phosphate. H. E. Ries, Jr. and H. D. Cook. *J. Colloid Sci.*, 1954, **9**, 535–46.—The Langmuir balance has been used to determine the surface properties on water of the 5 pure compounds and 2 binary equimolar mixtures given in the title; compounds the structures of which are related to those of lubricant additives. A table of the derived properties: surface area/mol at zero pressure, collapse pressure, and compressibility of film, are given.

Stearic acid and octadecylphosphonic acid form strong films and the collapse pressure (p) is high; p for *iso*stearic acid is *ca* ½ that of stearic acid, and p for the phosphates is

low. An equimolar mixture of stearic and *iso*stearic acids has monolayer properties close to the calculated average. An equimolar mixture of the dissimilar compounds stearic acid and tri-*p*-cresyl phosphate shows film properties of the phosphate at low pressures, expulsion of the phosphate from the monolayer at intermediate pressures, and properties of stearic acid at high pressures. H. C. E.

1099. Studies in water-in-oil emulsions—IV. Influence of the emulsifying agent on the viscosity of water-in-oil emulsions of high water content. P. Sherman. *J. Colloid Sci.*, 1955, **10**, 63–70.—Visc and stability of emulsions of composition 6·5% wt glycerine, 65·5% water (aq phase): 2·8% wt. X, 25·2% mineral oil (oil phase) were investigated, where X is a non-ionic emulsifying agent (*e.g.* mono- or tri-oleates, polyricinoleate). The difference between the relative visc and stabilities can be explained only as due to differences in the interfacial structure. 2 factors are discussed: (*a*) the physical nature of the interfacial film and its rheological properties, which affect the globular resistance to deformation when the system is subjected to shearing stress; (*b*) influence of adsorption at the interface on the vol factor $(\eta - \eta_0)^3/\eta^3\phi$, where ϕ is the vol concn of aq phase and η_0 and η are the visc of the oil phase and of the total emulsion. H. C. E.

1100. Oil dephenolization by pressure extraction in low-temperature carbonization plant, Offleben. H. Munderloh. *BrennstChemie*, 1955, **36** (5–6), 65–7.—Phenol-containing oil fraction 150°–210° C is treated with H_2O at 160° C and 15–20 atm in the apparatus illustrated and described. Thus more than 90% of the oil-phenol dissolves in the H_2O, which is dephenolized by conventional methods. R. T.

1101. Organic materials for radiochemical uses. J. F. Bennett. *Chem. Engng*, 1955, **62** (4), 226.—The resistance to radiation, chemicals, and temp are criteria for selection of plastics, which are also easily decontaminated. Charts are given to aid selection showing resistance to solvents and other reagents, and also the thermal properties are shown in chart form. Several lab tests are described. D. J. S.

1102. Synthesis and properties of hydrocarbons of high molecular weight. Their preparation and purification. W. Schiessler and H. Sutherland. *Rev. Pétrolière*, 1955, (963), 25.—The article is based on the report presented to the 34th Annual Conference of the API, on the research project No. 42 started in 1940 at the Pennsylvania State University, for the study of pure hydrocarbons of mol. wt. in the range of lub oils. It deals with the synthesis and purification of high mol. wt. hydrocarbons, a study of whose properties would be of assistance in elucidating the behaviour of lub oils.

Attention is drawn to the importance of eliminating unwanted reactions when attempting to synthesize a particular hydrocarbon. For example, when preparing dicyclopentyl-1-1-pentadecane, it is necessary to use *cyclo*pentyl lithium bromide instead of the corresponding magnesium compound in order to avoid the formation of unwanted substances.

The various methods of purifying high mol. wt. hydrocarbons are described, including fractional dist under 1 mm pressure, fractional crystallization, extractive crystallization using urea and thiourea, selective adsorption, and chemical methods, such as removal of a ketone by reaction with Grignard reagent to produce an alcohol with a higher number of carbon atoms which can be separated by fractional dist. W. W. G.

1103. Plant calculations for petroleum technologists. Pt II. Heat engines. T. K. Ross. *Petroleum, Lond.*, 1955, **18** (4), 130–3.—This is one of a series of articles intended to summarize the fundamentals of chemical engineering and indicate their application to the petroleum industry. In this article the laws of expansion and compression and the equations for theoretical cycles are stated and applied to multistage compression, refrigeration, etc. Some illustrative problems are worked. J. B. S.

1104. Multicomponent fractionation. R. Salmon. *Petrol. Engr*, 1955, **27** (2), C42–6.—Method is given for finding composition of products knowing feed composition, number of plates, and reflux ratio. It is an adaptation of the absorption factor approach of Thiele–Geddes. Results on 9 test calculations compare favourably with those from plate-to-plate calculations. J. B. S.

ANALYSIS AND TESTING

1105. Spectroscopy in the oil industry. Pt I. W. C. Price. *Petroleum, Lond.*, 1955, **18** (5), 161–4.—All the branches of spectroscopy—infra-red, U.V., and Raman—have been successfully applied to problems of the petroleum industry, and some use has been made of emission as well as adsorption spectroscopy. A brief description is given of types of instruments used and methods employed in infra-red analysis and a review given of some of the numerous applications of infra-red spectroscopy. J. B. S.

1106. The chromatographic analysis of hydrocarbon mixtures. B. W. Bradford, D. Harvey, and D. E. Chalkley. *J. Inst. Petrol.*, March 1955, **41** (375), 80.—A brief review is given of the main chromatographic methods found useful in the analysis of hydrocarbon mixtures, and some recent developments are discussed in more detail. Work on hydrocarbons falls into 3 main types, liq-phase separation on columns of solid absorbents, vapour-phase separation on columns of solid absorbents, and vapour-phase separation on composite partition columns. Vapour-phase techniques have developed rapidly in recent years, and most of this paper is devoted to them. 20 literature refs and the discussion on the paper are included. U. M.

1107. Paper chromatographic separation of simple phenols. D. Schleede. *BrennstChemie*, 1955, **36** (5–6), 78–9.—Investigations on the paper chromatographic separation of simple phenols and the transfer of the results obtained to the paper chromatography of phenol fractions obtained in dist of phenol extracts. Identification and quant estimation of individual components is possible by running pure substances concurrently or by washing out the spots and subsequent U.V. photographs. R. T.

1108. Continuous ion exchange with an endless belt of phosphorylated cotton. C. H. Muendel and W. A. Selke. *Industr. Engng Chem.*, 1955, **47** (3), 374–9.—The concn of copper ions in dilute copper sulphate soln was studied with a continuous belt of phosphorylated cotton, regenerated in conc brine, as the exchange medium. The system copper–hydrogen was also studied for comparison, using H_2SO_4 as regenerant. Equilibria and rate data studies showed resistance to internal diffusion in the medium to be the primary rate controlling mechanism and liq phase diffusion and chemical reaction rates to be less important under most operating conditions. Results for a small scale apparatus indicated that although the mass transfer coeff were lower than expected, the process could be operated successfully. B. A. F.

1109. Equilibrium ratio charts for hydrocarbon systems. E. I. Organick. *Oil Gas J.*, 18.4.55, **50** (53), 136.—Equilibrium ratio charts for hydrocarbon systems are about to be published by the Natural Gasoline Association of America. A K-chart index is given. G. A. C.

1110. The charcoal weight test. E. Kirk. *Oil Gas J.*, 18.4.55, **50** (53), 148.—The method, accuracy, and application of the charcoal weight test for determination of C_{3+} and C_{4+} content of natural gas by the Snyder procedure is described, and an alignment chart for concn per 1000 cu. ft. of gas is provided. An analysis can be completed in between 45 min and 2 hr. G. A. C.

1111. Radioactivity. D. S. McArthur. *Petrol. Process.*, 1955, **10** (2), 214–16.—Since 1940 the use of radio-isotopes in industrial work has become popular. The article gives a

basic understanding of radio-activity in considering possible applications in the petroleum field. J. H.

1112. Separation of mineral oil–vegetable oil mixtures using adsorption columns. R. P. Harker. *Chem. & Ind.*, 1955, 592.—Separation of either simple mixtures or detergent-containing emulsions. Former by dissolving in petroleum ether (40°–60°C) and chromatographing through Al_2O_3, mineral oil eluted with petroleum ether, fatty oil with acetone. Emulsions are freed from detergent by a column of ion-exchange resin (which can also contain activated C), oils are then removed by elution with $(CH_3)_2CO/CHCl_3$. V. B.

1113. Poise-meter. Electrical viscometer. Anon. *Brit. Petrol. Equipm. News*, 1955, **4** (4), 40.—A new instrument providing a continuous measure of visc is described. Essentially, an electric motor drives a drag member in the fluid, and variation in drag affects current values in the input circuit. High accuracy, strength, and simplicity are claimed. E. A. G. H.

CRUDE OIL

1114. Heat of reaction in oil decomposition. G. Huck. *BrennstChemie*, 1955, **36** (3–4), 37–8.—The heat of decomp of petroleum is calc from published data of investigations on the heats of formation of the reacting substances. Some conclusions are drawn from this on the preferential formation of olefins and aromatics, and the advantages of injecting oil on to hot coke are emphasized and explained. Further economic propositions are preheating the oil by waste furnace heat or raising the coke layer, which comes into contact with the oil. R. T.

GAS

1115. L.P.G. sales continue upswing. G. R. Benz, P. N. Tucker, and W. F. DeVoe. *Petrol. Process.*, 1955, **10** (2), 198–200.—Total sales of LPG in 1954 were 5,134,000,000 gal, 4·1% higher than 1953 sales. Of this 3,250,000 gal were used for domestic and motor fuels, 9·2% greater than last year; gas manufacturing and synthetic rubber component sales were down from 1953; sales for chemical and industrial use increased moderately. 20 new sources for LPG were completed or nearly so in 1954 with a potential production of over 700 million gal: total storage underground is estimated to be 708 million gal by Jan. 1955, annual increase of 50%. J. H.

ENGINE FUELS

1116. The key to road performance? V. B. Guthrie. *Petrol. Process.*, 1955, **10** (2), 211–13.—The extent to which fuel sensitivity, *i.e.*, the numerical difference between Research O.N. and Motor octane, can be used as an indicator of actual vehicle anti-knock behaviour on the road is the subject of a current research programme by the Ethyl Corpn. High sensitivity is indicative of the decreasing ability of a fuel to resist knocking as engine operating conditions become more severe, or conversely, increasing ability to resist knocking with milder operating conditions, *i.e.* it tends to give best performance in those engines which rate fuels at or above the research method. Numerous charts and tables are included for the purpose of comparison. J. H.

1117. What next in motor fuels? Anon. *Petrol. Process.*, 1955, **10** (3), 343–7.—2 problems facing the petroleum processing industry today are how to provide more of the kerosine-type fuels for jet and gas turbine-type engines and how to meet the continually increasing demand for higher octane by conventional piston-type engines. More volatile gasoline may be the so ution by dropping out the higher-boiling components, thereby reducing engine deposits and cutting down on octane requirements for any given car, and thus making available more of the lower cuts from the crude, which are needed for turbine and jet fuels. J. H.

1118. Octanes and compression ratios still up. Anon. *Petrol. Process.*, 1955, **10** (3), 346–7.—The 10 : 1 C.R. piston-type automobile engine may be introduced in small numbers as early as next year, because the high anti-knock quality fuels can be made available to operate them satisfactorily. By 1965, for example, the average premium gasoline being sold may well be 100 research O.N. and the average C.R. of new cars *ca* 9·43 : 1 with a 12 : 1 C.R. engine coming along. J. H.

1119. Additives for fuels and lubricants. C. M. Larson. *Petrol. Engr*, 1955, **27** (3), C44–53.—Higher C.R. mean higher O.N. and greater demand for premium grade gasoline, hence all additives in greater demand. Anti-knock agents, anti-oxidants, metal de-activators, etc., are all considered from demand and new development point of view, as are additives for fuel oils, diesel, jet fuels, lub, and cutting fluids. J. B. S.

1120. Coarse vacuum combustion investigations. E. Sänger. *BrennstChemie*, 1955, **36** (5–6), 87–9.—The problem of perceptible loss of combustion eff of jet aircraft at ht >10 km is discussed. Causes are attributed to decreasing burnt gas density, due to lower quality of liq fuel sprayed-in in stationary firing. It is decided therefore to imitate the conditions of high combustion in large fixed lab coarse vac furnaces. By spraying pre-mixed fuels at different temp into the combustion chamber means may be found for tech improvement of high combustion. R. T.

1121. Automobile production and petroleum consumption—outlook for 1955. Anon. *Rev. Pétrolière*, 1955, (963), 13.—As 75% of the consumption of gasoline is absorbed by motor vehicles, all estimates of gasoline demand should pay particular attention to the "automobile population." Statistics for the production of cars in France, Great Britain, Germany, and Italy, are given, and the future programmes of car manufacturers in Europe and the U.S.A. are considered.

The United Nations' report on the future demand for energy in W. Europe to the period 1963 is also discussed. For 1955, the estimate for gasoline consumption given by E. Holman, President of the Standard Oil Co, New Jersey, is a good guide, namely, an increase of 5% for the U.S.A. and 7% outside the U.S.A. W. W. G.

LUBRICANTS

1122. Petroleum residua as sources of lubricating oil. N. W. Furby. *Industr. Engng Chem.*, 1955, **47** (3), 480–6.—Rough evaluation of crude oils as sources of lub oil is obtained quickly by a new method based on the Conradson carbon, % sulphur, % wax, and visc gravity constant of crude residua. B. A. F.

1123. Fluorine-containing lubricants. A. J. Rudge. *Chem. & Ind.*, 1955, 452–61.—Methods for preparation of fluorocarbons and chlorofluorocarbons are described. Replacement of last traces of H in fluorocarbons prepared from petroleum fractions is difficult but in many cases unimportant. Stabilities and physical and elect properties of fluoro-, chlorofluoro-, and other synthetic lubricants are compared, illustrating excellent thermal and chem stabilities of F-containing products. Chlorofluorolubricants possess most advantages of fluorocarbons at greatly reduced costs. V.I. of both types are poor, but some products have good E.P. properties. Polytetrafluoroethylene is an effective solid lubricant of particular value on account of its thermal and chem stabilities. B. S. W.

1124. A new grease plant. Anon. *Brit. Petrol. Equipm. News*, 1955, **4** (4), 38–9.—A brief description of the new Vacuum Oil Co grease plant at Birkenhead is given. Saponification takes place in a "contactor" vessel and final grease manufacture in a "kettle." Certain limited details are quoted for the main equipment items. E. A. G. H.

1125. Choosing grease making equipment. O. L. Yacham. *Petrol. Process.*, 1955, **10** (4), 505–10.—In the choice of the grease kettle and accessories it is important to ensure that the equipment is not under-powered, leading to lower quality and less uniform products; selection of agitators is also mentioned. In the choice of heating systems, jacketing is preferred to direct firing; an increasingly popular heating medium is circulating hot mineral oil. The choice of grease pumps, milling and de-aeration equipment, filters, and continuous grease plant equipment is discussed, together with materials handling. Cost information on the various items of equipment is listed on 1954 estimates. J. H.

BITUMEN, ASPHALT, AND TAR

1126. Shell bitumen for producing asphalt mixed macadam. Anon. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (2), 47–9.—Abstract of book "Strassenbau mit Shell Bitumen," German Shell A.-G., Hamburg 36, with some added relevant information. R. T.

1127. Is the demand for fillers incapable of swelling, justified in bituminous masses? A. W. Rick. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (2), 56–7.—Advantages and disadvantages of sp org and inorg materials—capable or incapable of swelling—in bituminous constructions and roofing paper are discussed and explained. R. T.

1128. Neutral constituents of low-temperature coal tar, *e.g.* in the light oil boiling range 134°–188° C. A. Jäger and G. Kattwinkel. *BrennstChemie*, 1954, **35** (23–24), 353–62.—On p. 359 last line of paragraph: "D. *iso*paraffins and naphthenes" and "*cyclo*heptanes" to be erased. R. T.

1129. Wood impregnation with coal tar oil with special regard to prevention of subsequent oil exudation. G-Z. Jonas. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (3), 74–6.—Physical and chem factors which influence exudation of tar oil from impregnated wood, structure, visc, and capillary forces are discussed. Polar org impregnating media are influenced by their dipole moment, also the size of the carbophilic, hydrocarbon-like rest. In striving for mol arrangement at the phase contact surfaces the different relationships prevailing must be borne in mind; they depend largely on mol size and shape. The explanation of org compound and H_2O orientation of contact surfaces is that the compounds used are hydrophilic and hydrophobic, whereby the former strive for combination, the latter avoid association with H_2O. The cellulose wood mol is hydrophilic and opposes oil pen in the narrow capillaries during steeping. Better pen, oil distribution, and suppression of subsequent sweating are given by introducing substances, "combining bridges," to the tar oil, or as vapour into the wood before impregnation. A steam treatment of the wood gives good results. 14 literature refs. R. T.

1130. Dependence of smell development of tar pitch—containing parquet floor adhesives on the type of under-floor. H. E. Müller. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (3), 77–9.—Strong smells resulting from using standard brushable adhesives for parquet floors (DIN281) indicate the necessity for special attention to type and condition of the under-floor. Use of such standard adhesives may be justified, but reciprocal action between adhesive and under-floor may take place. This may occur where the actual under-floor is covered with a moisture-insulating bitumen paper. By furnishing information on incompatible adhesives and floors the producer renders economical service to himself and customers. Also the articles of the new edition of DIN281 are carried out. R. T.

SPECIAL HYDROCARBON PRODUCTS

1131. Transformer oil: properties of naphthenic and aromatic fractions. R. N. Hazelwood, R. M. Frey, and J. B. Broecker. *J. Electrochem. Soc.*, 1955, **102**, 170–5.—Percolation through silica gel and elution with MeOH. 82·5 vol % naphthenes, balance aromatics, no paraffins. Chem and phys properties, including *n–d–M* analysis and D.C. conductivity, of the 2 fractions tabulated. Main investigation was on behaviour of fractions in arcing (A.C.) tests; principal reaction in both types is decomp to H_2, C, and hydrocarbon gases. Gas vol formed approx same for both components, average 55 ml/kw. sec, gases from arcing aromatics appear to have more C_2H_2 than from naphthenes; aromatic concentrate produces *ca* 3 times as much C as naphthenic. As secondary reaction arcing of naphthenes tends to formation of aromatics and decrease in mol. wt.; in arcing of aromatics condensation reactions, with increase of mol. wt., occur. Mechanism of hydrocarbon breakdown in arc and analogy with thermal cracking discussed. Previous work reviewed, 27 refs. V. B.

DERIVED CHEMICAL PRODUCTS

1132. Synthetic elastomers. R. T. Woodhans and P. F. Bruins. *Petrol. Engr*, 1955, **27** (3), C54–60.—A report is given of 4 new development stage elastomers with a good future. Acrylic elastomers, when vulcanized, show unusual resistance to heat and hot mineral oils as well as to atmospheric degradation and flexural breakdown. Hypalon, made by treating polyethylene with Cl_2 and SO_2, is resistant to abrasion, heat, sunlight, and weather. Alfin rubbers show superior abrasion resistance, high flex life, and excellent ageing properties. Polyester rubbers also have high abrasion resistance, good elasticity, and good processing, combined with oxidn and ageing stability, non-swelling in oil and benzene, and very high tear resistance. J. B. S.

1133. Acetylene from natural gas and petroleum. P. W. Sherwood. *Erdöl. u. Kohle*, 1954, **7** (12), 819.—The use of acetylene has changed fundamentally in character since the second world war. Whereas formerly, acetylene was used mainly for welding, now *ca* 70% of the consumption of this gas is for chemical synthesis.

In the U.S.A. the yearly production of acetylene is *ca* 220,000 tons, of which 90,000 tons is from hydrocarbons, and it is estimated that the requirements for chemical synthesis in 1955 will be divided up in the proportions: 30% vinylchloride, 28% neoprene, 20% trichlorethylene, 10% acrylonitrile, 8% vinyl acetate, 4% other products.

The main processes for the production of acetylene from paraffin hydrocarbons are:

(1) *Partial Burning of Methane.* Methane of 95% minimum purity mixed with oxygen is burnt in specially designed burners and the combustion gases are immediately cooled so as to give the acetylene formed no time for further reaction. The average temp of the reaction is 1500° C and the time 0·01 sec. The special burner was designed for the Sachsse process for partial combustion. There are 3 plants in the U.S.A. using the partial oxidn process—American Cyanamide Co, Monsanto, and Carbide and Carbon.

(2) *Thermal Cracking Process.* Used for acetylene production when cheap hydrocarbons are available. The Wulff process, using a specially designed cracking furnace, has been developed in the U.S.A. The plant has a yearly capacity of *ca* 500 tons, and the feed is natural gas, ethane, or propane.

The highest yield of acetylene by thermal cracking is obtained when the feed is ethane, *i.e.* 49 kg/100 kg feed (with recirculation), while only 25·6 kg is produced per 100 kg of methane charged.

(3) *Electrical Pyrolysis.* At the Hüls Chemical Works, acetylene is produced by passing methane of 92% purity through an electric arc at an estimated temp of 1600° C with a reaction time of 0·01 sec. The gases leaving the reactors are cooled by water spray to 150° C to prevent further reaction. From methane, the yield of acetylene is 13% and from ethane and propane the yield is 15–16%.

Another electrical pyrolysis process (Schoch process) has been developed in the University of Texas.

Details are given of various methods of purifying the acetylene, including the use of selective solvents, such as dimethylformamide, and of active carbon. W. W. G.

1134. A new type of oil additive to control low-temperature sludging. Anon. *Petrol. Process.*, 1955, **10** (4), 516–17.—A new motor oil detergent additive, a copolymer of laurylmethacrylate and diethylamine ethyl methacrylate, has been developed by du Pont to check the formation of sludges in engines in stop-and-go driving. It is also claimed to be effective in the presence of engine coolant leakage into the crankcase and of aq blow-by condensate in the oil, and other low temp engine operation. For gasoline engines only, it is added in the amount of 1–2% as an ashless viscous, straw-coloured liq. J. H.

1135. Five methods for injecting petroleum additives. L. Lowy. *Petrol. Process.*, 1955, **10** (3), 357–60.—On a broad classification, there are 5 methods of injecting additives into petroleum products, namely, constant flow injection, flow proportional injection, high rates of injection, dry additive injection, gravimetric injection control. In any additive feed system, consideration must be given to the form in which the compound is to be injected. For purposes of economy, it is wise to reduce handling operations to a minimum. However, due to various factors, it is often necessary to convert the additive from the form in which it is received. J. H.

1136. Ammonia, what does it cost to make? B. S. Duff. *Petrol. Process.*, 1955, **10** (2), 223–8.—The synthesis of ammonia consists of reacting 3 vol of hydrogen with one vol of nitrogen. The nitrogen in most commercial processes is obtained from air. The cost of obtaining hydrogen in a form suitable for ammonia synthesis is the most important variable in the economics of ammonia manufacture. The article compares the cost of manufacturing ammonia with hydrogen obtained from natural gas, residual oils, coal, coke-oven gas, and refinery cat reformer off-gas using a single process scheme of synthesis gas preparation, purification, and synthesis. J. H.

1137. Development of petrochemical industry in Italy. Anon. *Rev. Pétrolière*, 1955, (963), 16.—Based on a report by G. E. Limido on a recent visit to Italy and dealing with petrochemical developments in that country. 2 sources of raw materials are methane (natural gas) and hydrocarbons from the refining industry. In Italy, the chemicals based on methane are most developed owing to the abundant supplies of this gas for raw material and as a source of power. The price of the gas is low and will be further reduced as the consumption rises.

The 2 chief companies in the industry are Montecatini and Edison, the latter in association with Monsanto.

Montecatini, from methane as raw material, produce hydrogen, used for the manufacture of ammonia at Novare (150 tons daily) and also methanol. They are developing a process for the manufacture of hydrogen cyanide from methane and ammonia, and they have reached the pilot plant stage in the production of acetylene and acrylonitrile.

Edison (through the subsidiary Vetrocoke) are producing acetylene from methane by the BASF process.

Montecatini have at Ferrare plant for cracking oil fractions having a capacity of 20,000–25,000 tons p.a. of ethylene and propylene as well as 5000 tons p.a. of butylene and 1500 tons p.a. of butadiene. At Terni they have a plant producing 12,000 tons p.a. of polyvinyl and at Savone, a plant of capacity 40 tons p.a. of ammonia.

A.N.I.C. in association with the Standard Oil (S.T.A.N.I.C.) have a number of petrochemical plants, including the hydrogenation of vegetable and animal oils for the production of margarine and also the hydrogenation of triglycerides for the manufacture of fatty alcohols from which synthetic detergents can be made.

Mention is also made of proposals for Franco-Italian collaboration to produce synthetic rubber, France to make butyl rubber, and Italy, G.R.S., including arrangements for the exchange of raw materials for the manufacture of these products. W. W. G.

COAL, SHALE, AND PEAT

1138. Importance of oxidation with nitric acid for elucidating coal composition. A. Benning. *BrennstChemie*, 1955, **36** (3–4), 38–43.—Tech and scientific importance of coal oxidn with HNO_3 are discussed. Conditions of oxidn are sought which give an especially valuable mixture of acids. No cogent conclusions for the constitution of coal can be derived from the nature and quantity of the acids found. However, the oxidn of model substances permits certain analogous conclusions respecting the structure of coal. It is shown chiefly that, in oxidn with dil HNO_3 the systems present in the coal with CH_3 groups give aliphatic and benzene carboxylic acids, whilst the aromatic ring systems are attacked only with difficulty and yield higher-mol humic acids. These acids can be decomp to further carboxylic acids with more powerful oxidants. 13 literature refs. R. T.

1139. Information on the physicochemical principles of recovery and decomposition of phenol fractions from coal tar and brown coal low-temp carbonization tar. E. Terres *et al.* *Brennst-Chemie*, 1955, **36** (5–6), 67–78.—Report 1. The principles of chromatographic separation methods. Fundamentals of chromatographic separation methods are discussed. The adsorption isotherms of Langmuir–Volmer and of Ostwald, Boedeker, and Freundlich are jointly derived and present 2 borderline cases of a law comprising them. An equation for the connexion between distribution and phase concn comprehends the influence of association and dissociation on distribution. The relation of the RF-val (defined) to the distribution conditions of a substance between the mobile and the stationary solid or liq phase is derived in a new way. 2 approximation formulæ for calculating the concn of a material in the region of concn-max are given and explained. For paper chromatography they have significance for judging spot size and related questions, *e.g.* the No. of stages of the distribution. The dissociation of weaker acids in the liq. stationary phase is recognized as the reason for the elongated spot in the distribution chromatogram. 34 literature refs. R. T.

1140. Estimation of pitch content of coal briquettes. W. Winzen. *BrennstChemie*, 1955, **36** (5–6), 85–7.—A new improved method is presented for rapid and accurate estimation of the pitch content of coal briquettes. Disadvantages of the old method are compared with advantages of the new one, and each apparatus is illustrated. R. T.

1141. Olefin and benzene formation in the coke oven. J. Ewers. *BrennstChemie*, 1955, **36** (3–4), 33–7.—Recent efforts have been directed to altering the conventional fixed ratio of coke to valuable products obtained in coke plants and gas works. Efforts to increase gas and C_6H_6 yield by coking coal–oil mixtures do not permit optimum conversion of the oil charged into valuable products. The possibility of controlling this process towards gas or olefin (C_2H_4) or towards aromatics does not appear. Mineral oil sprayed into the gas collector gives better conversion, also control to chiefly olefins or aromatics is possible. Adaptation of temp and residence time of the reacting materials in the reaction chamber are of decisive importance. Low reaction temp and medium residence or higher temp and corresponding residence favour optimum olefin formation. Optimum aromatic formation is favoured by higher reaction temp and medium residence, or still higher temp and corresponding shorter residence. Residence times can be regulated by the oil charged per unit time or by adding carrier gas. R. T.

1142. Entrained-solids retorting of Colorado oil shale. H. W. Sohns *et al.* *Industr. Engng Chem.*, 1955, **47** (3), 461–8.—Controlled retorting of 30 gal/ton oil shale, using steam to entrain fine particles of shale, was used to study the effect of temp on oil and gas products in the range 1000°–1650° F. Furnace residence time lay between 3·7 and 6 sec, but resi-

dence time as a variable was not studied. After removal of the shale in 5 cyclone separators the oil and gas products were collected and fractionated. At 1000° F the products were similar to those obtained in the standard N.T.U. apparatus. As the retort temp increased the products became more dehydrogenated and aromatic and the quantity of gas increased. The max naphtha yield was at 1200°–1300° F, the product having a high octane rating. B. A. F.

MISCELLANEOUS PRODUCTS

1143. Vinyl resins and the oil industry. Anon. *Petrol. Times*, 15.4.55, **59** (1505), 382.—A review of the properties of polyvinyl chloride and its oil industry applications. The use of flexible PVC in coatings and linings for tanks is described, as well as the use of rigid PVC for pipeline coatings. 2 refs. C. B.

CORROSION

1144. Laboratory evaluation of inhibitors for sweet gas-condensate wells. P. J. Raifsnider, R. S. Treseder, and A. Wachter. *Corrosion*, 1955, **11** (1), 3–5t.—Lab test methods for evaluation of corrosion inhibitors for use in sweet gas-condensate wells are described. A rotated bottle-type test at 180° F with a steel strip in a mixture of kerosine and water is used to select possible inhibitors. Additional tests under varied conditions are made to evaluate persistence of inhibition. A sealed tube test has been developed to assess the corrosiveness of concentrated inhibitors to steel at well bottom temp.

Good correlation was obtained between the lab test results and field trial experience. W. G. R.

1145. Proposed standardized laboratory procedure for screening corrosion inhibitors for use in oil and gas wells. N.A.C.E. Technical Unit Committee T-1K. *Corrosion*, 1955, **11** (3), 143–6t.—This report describes a static oil and water immersion test using the wt loss of a steel coupon when under the influence of an inhibited system, compared with its wt loss under an uninhibited system as a criterion of corrosion protection. W. G. R.

1146. Corrosion evaluation of ship bulkhead and hull plating by audigage thickness measurements. D. J. Evans. *Corrosion*, 1955, **11** (3), 109–14t.—An ultrasonic method of evaluating the corrosion of ship's plating is described. It is claimed that experienced engineers are consistently obtaining accuracies of the order of $\pm 1\%$, making possible the measurement of corrosion rates of *ca* 0·005 inches/year. When pitting is very severe—greater than 20% of the plate thickness—no readings are obtained. W. G. R.

1147. Combating corrosion in the vapour space of storage tanks containing acidic crude oil. A. H. Newberg and J. P. Barret. *Rev. Pétrolière*, 1955, (963), 17.—Corrosion due to acidic crude oil (hydrogen sulphide chiefly) has caused the replacement of entire storage tanks after only 2 years' service and the renewal of tank roofs after one year. At the present time, the corrosion problem due to this cause is serious and costly.

3 means of combating this corrosion are: (1) method of construction (including choice of material); (2) inhibitors; (3) coatings.

(1) Elimination of vapour space by use of floating roofs. Use of corrosion-resisting alloys is limited by high cost. For tanks of capacity 500–1000 brl the construction of roofs of aluminium alloy is of interest. Armoured plastics are being tried, but insufficient time has elapsed for an opinion on their economic value.

(2) Inhibitors in pipelines and vessels have been successful, but in the vapour space the use of gaseous inhibitors has found only partial success.

(3) Use of organic coatings is widespread, particularly in cases where protection is required in existing tanks. The choice of protecting material can best be made after carrying out accelerated tests of coated panels in the lab against attack by hydrogen sulphide, humidity, and air. The preparation of the metal surface before coating is very important, particularly in old tanks. Careful cleaning is necessary, the use of sandblasting is recommended, and the application of the coating is best performed by spray-gun, but roller coating is being successfully carried out. W. W. G.

1148. Cathodic protection applied to a large-diameter oil pipeline system. D. O. Griffith. *Corrosion*, 1955, **11** (3), 139–42t.—This article is a description of cathodic protection applied to a coated 24-inch line from W. Texas to the Houston Ship Channel. W. G. R.

1149. Tentative standard method for measuring electrical conductance of coating on buried pipelines. N.A.C.E. Technical Unit Committee T-2D. *Corrosion*, 1955, **11** (2), 99–102t.—A general method and an attenuation method for measuring the electrical conductances of buried or submerged pipelines are proposed. W. G. R.

1150. Use of high molecular weight corrosion inhibitors in petroleum refineries. H. H. Bennett. *Corrosion*, 1955, **11** (2), 59–72t.—The theory of adsorptive inhibitors is briefly discussed, and an account is given of coupon tests in refinery equipment to evaluate the effect of 3 semi-polar compounds in reducing corrosion. Data on concn, injection techniques, use of ammonia, and cost are also given. Significant reductions in the corrosion rates in crude dist units, steam reboilers, straight run de-isobutanizers, vacuum pumps, alkylation units, TCC units, etc., are claimed. The author reports that the detergent action of the inhibitors assists in reducing deposits to extend the period between shut-downs for cleaning, and concludes that the water-soluble inhibitors tested are sufficiently soluble in hydrocarbons to provide corrosion protection. W. G. R.

1151. Solution of cathodic protection interference problems. F. W. Ringer. *Corrosion*, 1955, **11** (3), 131–8t.—A method is described of obtaining data which will permit the extent of interference to be determined before permanent cathodic protection installations are made.

A brief discussion is given concerning the proper location of a ground bed in order to minimize the effect of interference on foreign structures. W. G. R.

1152. More heat, less corrosion. Anon. *Chem. Engng*, 1955, **62** (4), 140.—Continuous injection of amines into boiler feed water gives protection in steam condensing equipment and dropwise condensation on the tubes. D. J. S.

1153. Use of organic inhibitors in refinery distillation process equipment. G. E. Purdy. *Corrosion*, 1955, **11** (1), 48–51t.—The use of high mol. wt. organic corrosion inhibitor is discussed, and methods are recommended for its use to inhibit attack by H_2S, HCl, organic acids, and salts. Secondary effects are explained, and experiences in 120 refineries in the U.S.A. and Canada and 14 refineries in other countries are reviewed. W. G. R.

1154. How Arkansas Fuel Oil tackled corrosion. W. M. Kyger and G. L. Shepherd. *Oil Gas J.*, 18.4.55, **53** (50), 141.—The history of tube-bundle replacement in the E. Texas casing-head gas plant is given and use described of a high-mol. wt. polar, hydrocarbon, and water dispersible liq organic inhibitor to combat the corrosion. In the Panola gasoline plant boiler blow-down water was introduced to arrest corrosion, and in the de-ethanizer at the E. Texas plant corrosion products were cleaned out by a detergent. G. A. C.

1155. Metallizing for corrosion prevention. A. P. Shepard and R. J. McWaters. *Corrosion*, 1955, **11** (3), 115–18t.—A survey is given of the problems and techniques connected with metal spraying on iron and steel to prevent corrosion. Surface preparation, bonding coats, and organic sealers are included. The characteristics of zinc and aluminium are discussed, and recommendations are made for selection vs. environment anticipated. A list of recommendations for specific applications includes ship's hulls, oil tanker interiors, and industrial atmospheres. W. G. R.

1156. Corrosion aspects of the vanadium problem in gas turbines. S. H. Frederick and T. F. Eden. *Corrosion*, 1955, **11** (1), 19–33t.—The effect of V_2O_5 and mixtures of V_2O_5 and Na_2SO_4 on turbine fouling and corrosion is discussed. Lab tests show that none of the commercially available alloys is immune when these mixtures are molten, although Nimonic alloys have a better resistance to attack than austenitic steels, and some degree of protection is afforded by electrodeposited coatings of chromium.

Steels and heat-resisting alloys are not attacked to any extent below the m.p. of the ash, but copper base alloys suffer considerable corrosion at temp as low as 500° C.

Corrosion can be considerably reduced by the use of certain additives (*e.g.* ZnO, Al_2O_3, or kieselguhr), but if the additive is present in certain critical proportions the rate of attack can be accelerated, but when this is exceeded, corrosion is reduced. No such increase was found when MgO was used. W. G. R.

1157. Catastrophic corrosion resulting from vanadium pentoxide in fuel oil ash. A. de S. Brasunas. *Corrosion*, 1955, **11** (1), 17–18.—The corrosion resulting from burning fuel oils containing very small concn of vanadium is described and some lab experiments outlined. Experiments involving additives to fuel are mentioned, and sources of fuel oil containing greatest concn of vanadium are listed. W. G. R.

ENGINES AND AUTOMOTIVE EQUIPMENT

1158. Influence of power fuel on wear of cylinder liners and piston rings of Otto motors. H. Schildwachter. *Brennst-Chemie*, 1955, **38** (3–4), 44–54.—Causes of wear of cyl and piston rings are mechanical, thermal, and chem. The first 2 can be controlled through tests on materials, etc., the last is conditioned by the different power fuels and lub. The 3 overlap, and wear is difficult to measure excepting under const operating conditions. The effects of S, which plays an important part in both cold and warm conditions of operation, are discussed. Regarding the influence of power fuels on increased wear in the cold, power fuel and corrosion effects overlap. Lub for diminishing cold corrosion and higher wear on cold starting are considered. American data on this question show wear with leaded petrol 50%> with unmixed C_2H_5OH under the same conditions. Results are given and compared of wear experiments in 2 single-cyl motors, with unleaded petrol and petrol–alcohol mixtures, under accurately fixed operating conditions and measuring procedure so described. The object is to ascertain the positive or negative effect of added alcohol in power fuel mixtures on wear. Parallel to the wear measurements the effect of the fuels used on the lub, the oil carbon formation, and nature are observed carefully.

R. T.

MISCELLANEOUS

1159. Petroleum's role in synthetic rubber. Anon. *Petrol. Process.*, 1955, **10** (3), 375–7.—If the programme worked out for selling the Government's synthetic rubber facilities to private firms gets past Congress it will provide stiffer competition at both ends of the business—raw materials, finished products. It will provide a break in petroleum's near-monopoly on the butadiene end of the rubber industry but permit oil companies to enter into the styrene business for the first time. It will put petroleum companies in command of about a third of the G.R.S. copolymer capacity in the U.S.A. and leave oil companies in control of the 2 butyl rubber plants. J. H.

1160. Discussion on "The Beaver Report." Introductory remarks by G. E. Foxwell. *J. Inst. Fuel*, Apr. 1955, **28** (171), 175.—24-page report of the discussion, on the findings of the Air Pollution Committee, held at the Institute of Fuel on 20 Jan. and 2 Feb. 1955. D. K.

ADDITIONS TO THE LIBRARY

Oil Atlas of Western Canada. Alberta Volume. Edited by Jules Poscente and P. E. Jeal. Calgary, Alberta: Western Reproductions, 1955. $50.00.

This detailed map of Alberta on a scale of 4 miles to the inch occupies over 200 sheets each $8\frac{1}{2} \times 11\frac{1}{4}$ inches, which are contained in a strong loose-leaf cover closed with a zip fastener. Every well in the province is located and named and its status indicated by standard symbols.

A quarterly revision service is available at a cost of $80.00 per annum, and if advantage is taken of this the basic price of the atlas is reduced to $40.00. The revision service may be paid for quarterly ($20.00) on receipt of the revised pages.

To anyone interested in Canadian oil developments this atlas, and the corresponding volume covering the southern portions of Saskatchewan and Manitoba, can be of considerable use.

ASTM Standards on Electrical Insulating Materials (With Related Information). Philadelphia, Pa: American Society for Testing Materials, 1955. Pp. 660. $5.50.

This compilation includes the latest ASTM methods of testing and specifications for electrical insulating materials prepared by ASTM Committee D-9. The book includes 60 methods of test, 17 specifications, 3 recommended practices, and one list of definitions. 33 of the designations are either new or have been revised since the last edition of the compilation was published in March 1953.

4 appendices discuss: significance of tests of electrical insulating materials; recommendations for writing statements as to usefulness of tests of electrical insulating materials; and two proposed methods of test—one for dielectric constant and dissipation factor of aviation fuels and one for pasted mica used in electrical insulation. An index adds to the usefulness of the compilation.

Thermodynamic Properties of Methane–Nitrogen Mixtures. O. T. Bloomer, B. E. Eakin, R. T. Ellington, and D. C. Gami. Institute of Gas Technology, Research Bull. 21. Chicago, Ill: The Institute. Pp. 51. $3.50.

Gives data for computing energy needs for processes to separate nitrogen from natural gas by liquefaction and distillation.

Use of these data for calculation of the conditions and heat requirements for selected separation cycles employing distillation is illustrated. Comparative energy requirements, based on attainable compressor and expansion turbine efficiencies, for 5 cycles with varied operating conditions, are tabulated.

Included among the numerous illustrations are Mollier charts for nitrogen and methane, and a temperature–entropy chart for methane. Each of these charts has also been issued full-scale, on 22 × 34-inch sheets, and can be purchased separately from the Bulletin at $3.50 per set.

1955 SAE Handbook. New York: Society of Automotive Engineers, 1955. Pp. 1094.

Full details are given of all SAE standards and recommendations on automotive materials and construction, including ferrous and non-ferrous metals, electrical equipment, engine components, tractor equipment, non-metallic materials, etc. In the lubricant field the only addition is a note regarding multi-viscosity number oils. As regards fuels, some new general information is given regarding diesel fuels.

Interpretation of Engineering Data: Some Observations. Harold F. Dodge. ASTM Edward Marburg Lecture 1954. Philadelphia, Pa: American Society for Testing Materials, 1955. Pp. 36. $1.50.

The interpretation of engineering data is discussed from the viewpoint of quality engineering. Particular attention is paid to some of the simpler statistical methods, and it is concluded that quality control is an ideal goal and when attained in any segment of endeavour enables valid predictions to be made regarding the output of future operations. Statistical methods and quality control techniques are a means of approaching this goal.

Oil Equipment in Europe. T.A. Mission 121. Paris: OEEC, 1955. Pp. 136. Fr.F. 430. (Available from HMSO, London, 8*s.* 6*d.*)

The report of an OEEC Technical Assistance Mission appointed in 1953 to visit Europe and study the manufacture there of oil industry equipment. The countries visited were France, U.K., Belgium, Netherlands, and Germany.

It is concluded that the European refining industry can find practically all the equipment it needs in Europe, except for special equipment of U.S. design and manufacture in small demand and for some testing instruments.

Europe can produce all modern types of drilling machinery, although on a smaller scale than in the U.S.A., but it is still necessary to resort to America for special safety equipment, instruments, control gear, etc.

The Mission considered that the conclusions of Mission No. 57, which visited the U.S.A., still hold good, and they recommend that consideration of the following recommendations is still essential: (1) promotion of closer contact between manufacturers; (2) closer contact between manufacturers and oil companies.

Industrial Solvents and Flammable Liquids. London: Fire Protection Association, 1955. Pp. 20.

A comprehensive list giving properties most useful in assessing fire hazards of solvents and flammable liquids. Data covers flash point, water solubility, flammability limits, SIT, vapour density, melting point, boiling point, vapour pressure, and suitable extinguishing agent.

Failure of a Large Welded Oil Storage Tank. Manchester: The National Boiler and General Insurance Co. Ltd., 1954. Pp. 50.

In view of the wide interest in "brittle fracture" an original report, made in 1952 by The National Boiler and General Insurance Co. Ltd., for Whessoe Ltd., has been prepared for publication. The report concerns a 140 × 54 ft oil storage tank at Fawley which failed during a static water test. Following a preliminary survey, the bulk of the document is a detailed and illustrated factual report on material and construction details with results of mechanical tests of specimens taken after the failure.

Fuel Efficiency Pays. London: National Industrial Efficiency Service, 1955. Pp. 35.

The full report of a conference held in London in March 1955 and organized by the NIFES and the Combustion Engineering Association. Four papers read were: "Reducing steam raising costs" (J. Rylands), "Economics of power supply" (P. F. Morgan), "Steam saving pays" (Sir O. Lyle), and "NIFES contribution to fuel efficiency" (L. W. Jenkins).

ABSTRACTS

	PAGE
OILFIELD EXPLORATION AND EXPLOITATION	
Geology	125 A
Geophysics and Geochemical Prospecting	126 A
Production	126 A
Oilfield Development	128 A
TRANSPORT AND STORAGE	128 A
REFINERY OPERATIONS	
Refineries and Auxiliary Refinery Plant	129 A
Absorption and Adsorption	129 A
Solvent Extraction and Dewaxing	129 A
Cracking	130 A
Hydrogenation	130 A
Chemical and Physical Refining	130 A
Special Processes	130 A
PRODUCTS	
Chemistry and Physics	131 A
Analysis and Testing	131 A
Engine Fuels	131 A
Gas Oil and Fuel Oil	131 A
Lubricants	132 A
Bitumen, Asphalt, and Tar	132 A
Special Hydrocarbon Products	132 A
Derived Chemical Products	132 A
Coal, Shale, and Peat	133 A
CORROSION	133 A
SAFETY PRECAUTIONS	133 A
MISCELLANEOUS	133 A
BOOK REVIEWS	134 A
ADDITIONS TO THE LIBRARY	136 A

AUTHOR INDEX

The numbers refer to Abstract Numbers

Badger, W. L., 1217
Baker, O., 1191
Balka, W. H., 1219
Beltrame, F., 1189
Benning, A., 1231
Bergman, S. A., 1195
Berti, V., 1233
Blinov, V. I., 1234
Bombara, G., 1251
Boyd, C. W., 1205
Brodskii, A. M., 1213
Brooks, W. B., 1230
Brundred, L. L., 1183
Calhoun, J. C., 1185
Capdevila, N. R., 1218
Chapman, A. H., 1257
Chapman, J. R., 1260
Charnuii, I. A., 1179
Claussnitzer, J., 1245
Cole, J. A., 1239
Cornell, D., 1177
Corrigan, T. E., 1225
Crawford, P. B., 1180
Croes, G. A., 1178
Cunningham, L. J., 1194
Dart, J. C., 1211
de Hey, —, 1207
Dillon, C. P., 1216
Domask, W. G., 1221
Duce, J. T., 1257
Durandet, J., 1236
Elgie, W. G., 1198
Enright, R. J., 1169
Fast, L. J., 1255
Ferrell, R. D., 1220
Fetterly, L. C., 1221
Filak, G. A., 1232
Filatova, E. D., 1213
Gardiner, W. L., 1201
Gardner, F. J., 1164
Garthwaite, D. L., 1176
Geelen, H., 1229
Gianni, F., 1251
Gillet, A., 1250
Gladel, Y. L., 1226
Goebel, E. D., 1166
Grote, H. W., 1222
Haensel, V., 1222
Hall, C. C., 1223–4
Hange, F. C., 1202
Hatch, L. F., 1247
Hawkins, M. F., 1182
Heard, T. C., 1190
Higgins, G. E., 1187
Hoag, S. B., 1200
Hodson, P., 1254
Huge, E. C., 1253
Hugel, G., 1237
Hughes, C. J., 1239
Hunt, R. A., 1212
Jessen, F. W., 1161
Kays, W. M., 1203
Kellen, J. J., 1243
Keller, W. M., 1238
Klaver, R. F., 1229
Kobe, K. A., 1221
Krebill, F. K., 1176
Kröger, C., 1249
Lagerwey, —, 1207
Landau, R., 1246
Landrum, B. L., 1180
Lavrovskii, K. P., 1213
Lindner, J. D., 1184
Lowe, R., 1192
McCarver, H. C., 1174
McIntosh, W. A., 1243
McKetta, J. J., 1230
Martinez Cordon, J. L., 1228
Merriam, D. F., 1166
Miller, J. C., 1161
Mills, G. A., 1211
Neumaier, B. W., 1252
Oblad, A. G., 1211
Padovani, C., 1235
Palcari, C., 1235
Palmer, L. L., 1165
Parker, H. A., 1220
Paterson, E. V., 1236
Peavy, C. C., 1211
Perrine, R. L., 1181
Peters, M. S., 1214
Pier, M., 1215
Piotter, E. C., 1253
Polderman, L. D., 1216
Prater, N. H., 1205
Purcell, P. E. M., 1175
Reidel, J. C., 1210
Resen, F. L., 1199
Roark, G. E., 1184
Robinson, L. A., 1184
Roemershauser, A. E., 1182
Ruland, W., 1249
Rumble, R. C., 1186
Ryman, L. J., 1162
Sandlin, H. L., 1232
Schay, F. J., 1260
Schillmoller, C. M., 1252
Schmitz, P. M. E., 1188
Schuman, S. C., 1248
Schwarz, N., 1178
Siniramed, C., 1233
Steele, A. B., 1216
Sterba, M. J., 1222
Sterkman, —, 1207
Stewart, F. M., 1176
Stockholm, C. J., 1233
Sukkar, Y. K., 1177
Swerdloff, W., 1191
Taylor, A. H., 1223
Taylor, E. H., 1255
Tayloy, J. B., 1209
Tunson, J. R., 1220
Vener, R. H., 1227
Villar, G. E., 1208
Warren, J. E., 1185
Wassall, H., 1168
Waterman, H. I., 1229
Westerdijk, J. B., 1229
Wilder, A. B., 1193
Williams, S. V., 1194
Willson, C. O., 1256
Wilson, W. A., 1212
Younger, A. H., 1206
Zimmerschied, W. J., 1212

OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

1161. Investigation of the use of the spectrograph for correlation in limestone rock. F. W. Jessen and J. C. Miller. *J. Petrol. Tech.*, 1955, **7** (2), 41–4.—The differentiation and correlation of some limestone and dolomite units in surface and subsurface work sometimes presents difficulties, and this has been the case in the W. Texas Permian basin, where electric and radio-active logs, and the insoluble residues have not been particularly helpful. Palæontology is the ultimate criterion, but its application is tedious. Rapid chemical analysis by means of the spectrograph has therefore been attempted. In the Mississippian of N. Montana differences in the percentages of Mg, Fe, Al, and Sr have been useful. Work on cores from the "Canyon" reef fields of W. Texas is described, using a qualitative or semi-quantitative approach. In the qualitative work the lines of 36 elements were sought, some being capable of identification by one line, others by 2. Semi-quantitative studies were made for Ca, Al, Fe, Mn, Cu, and Cr, the accuracy being ±30–50%. Rather good correlation was obtained on the basis of variations in Mn, Al, Cu, and Cr. Al is indicative of clay content. Nickel was frequently detectable, and Vd was recorded. G. D. H.

L

1162. Southwest Muldoon believed now fully developed. L. J. Ryman. *Oil Gas J.*, 7.2.55, **53** (40), 100.—The geology and development of the SW. Muldoon field between Houston and San Antonio, Texas, are described.

The field was discovered in 1950 by I. Alfred Steinhauser which was completed for 66 b.d. from 2318–2326 ft in Steinhauser sand; by May 1954, 24 producers had been completed.

The structure is a faulted anticlinal nose, and trapping is due to nosing and faulting, and local permeability control. The penetrated section ranges from undifferentiated Wilcox to Yegua (Eocene), and production is from 3 sands in the Claiborne and Drenner; Arnim 1, Steinhauser, and Drenner. The Drenner may have a tilted water table, the oil–water contact varying from 1871 ft sub-sea to 1882 ft, or approx 5°.

A structural map and cross-section of the field are included.

C. A. F.

1163. Salt-dome record set. Anon. *Oil Gas J.*, 18.4.55, **53** (50), 109—Oil has been found beneath a salt overhang on the N. flank of the Cote Blanche Island salt dome off the coast from St. Mary Parish, Louisiana. The discovery, 1 Caffery on test flowed 1,800,000 cu. ft. gas and 33 b.d. of 41° dist from 16,410–16,415 ft after penetrating 12,500 of salt.

Cote Blanche is one of 5 islands, each overlying a piercement salt dome. C. A. F.

1164. Northwest Arkansas—neglected prospect? F. J. Gardner. *Oil Gas J.*, 7.2.55, **53** (40), 163.—There has been little exploration in NW. Arkansas in recent years, although the area has favourable gas and oil possibilities. Gas has been produced in the Arkansas Valley since 1902, and *ca* 28 long-life fields have been developed in Pennsylvanian sands; pre-Pennsylvanian beds in the area have not been adequately tested. Beds from Upper Cambrian through Mississippian in N. Arkansas show favourable conditions with oil indications, and there are many untested anticlines. C. A. F.

1165. Floresville–Stockdale; where shallow pools may mark deeper pay horizons. L. L. Palmer. *Oil Gas J.*, 7.2.55, **53** (40), 164.—The geology and oilfield development along the Floresville–Stockdale trend, *ca* 35 miles SE. of San Antonio, Texas, are outlined. The trend is a fault zone along which a number of fields are aligned, including Poth and E. Floresville, which produce from Eocene sands in fault traps. Unexplored deeper beds such as the Edwards lime and Austin chalk have important possibilities along the trend. C. A. F.

1166. Here's why Northwest Kansas beckons. D. F. Merriam and E. D. Goebel. *Oil Gas J.*, 18.4.55, **53** (50), 252.—There has been increased exploration in W. Kansas in recent years, indicating possible stratigraphic traps near the Cambridge arch similar to those by the Central Kansas Uplift.

The discovery and geology of the Norton field is described; it is situated on the SE. end of the Cambridge arch, which is an anticlinal feature separated from the Central Kansas Uplift by a saddle. Oil occurs in the Arbuckle and Reagan, which form a wedge between the pre-Cambrian basement and the overlying Pennsylvanian, and the accumulation is a stratigraphical trap with anticlinal folding. Over 90 producing wells have been completed in the field. C. A. F.

1167. What Ohio learned from world's deepest well. Anon. *Oil Gas J.*, 7.2.55, **53** (40), 109.—The world's deepest well in the Paloma field, 25 miles SW. of Bakersfield, California, has been abandoned as dry at 21,482 ft; cost of the well was approx 2½ million dollars. Objective of the test was Eocene Pt of Rocks sand expected at 20,500 ft but at total depth the well was in Lower Miocene. After a lengthy fishing job, 5 intervals between 14,050 and 17,135 ft and 3 between 11,520 and 13,260 ft were tested, but none showed commercial production.

Earth temp below 20,000 ft was over 330° F, and special oil-base drilling fluid was used below 11,000 ft. C. A. F.

1168. Key Cuban test finds Tertiary sands. H. Wassall. *Oil Gas J.*, 9.5.55, **54** (1), 172.—A test, 2½ miles W. of the Jatibonico field in Cuba has penetrated 4500 ft of Tertiary beds similar in lithology to those of the Gulf Coast, and has proved a thick Tertiary basin in the area.

Potential reservoir sands have been found and Eocene or post-Eocene faulting is indicated. Possible oil traps include fault traps and overlap against the pre-Tertiary unconformity.

Oil produced in the Jatibonico field from fractured U. Cretaceous volcanic rocks may have seeped from Tertiary reservoirs which are structurally lower due to faulting.

A cross-section of the Jatibonico field is included. C. A. F.

1169. Texans begin oil search in Honduras. R. J. Enright. *Oil Gas J.*, 9.5.55, **54** (1), 96.—Exploration has been carried out in W. Honduras and a well is to be drilled near Tusi Viejo on the shore of Laguna de Cartina; oil seeps have been found in the area and an anticline is reported.

Further exploration in Honduras will include seismic surveys along the N. coast of the country and in offshore areas. Only 3 wells have been drilled in Honduras, and little is known of the sediments.

A well is also to be drilled in British Honduras, where exploration has been carried out during the past 3 years. C. A. F.

1170. Peru gets offshore pay. Anon. *Oil Gas J.*, 9.5.55, **54** (1), 102.—A well drilled directionally to a submarine structure in the Lobitos area of Peru found Salinas oil sand from 6893–6960 ft. The zone had been found productive on-shore and is producing from 2 wells. C. A. F.

1171. Israeli tests dry. Anon. *Oil Gas J.*, 9.5.55, **54** (1), 102.—The Tel-es-Safit well, 25 miles SW. of Jerusalem, and the Beeri well on the coast S. of Gaza have been abandoned as dry, and the Rekhme well, 25 miles S. of Beersheba and Carmel 1, near Haifa, have been suspended.

The Kurnub well in the Negev has found gas at 785 ft, and gas and heavy oil shows are reported from the Massada well near the Dead Sea.

Further deep tests are to be made in Israel. C. A. F.

1172. New show in France. Anon. *Oil Gas J.*, 9.5.55, **54** (1), 100.—A well drilled *ca* 7½ miles NE. of the Parentis field in SW. France produced on test 6 brl oil and mud in 2 hr from limestone (? Lower Cretaceous) at *ca* 7900 ft.

Ca 5 miles S. of Parentis the Pontex wildcat was abandoned as dry at 8883 ft and SE. of Parentis, the Bouglon well was abandoned at 9730 ft after faint shows in Trias.

A second well is being drilled at Carcans 25 miles NW. of Bordeaux, where the first well found a little oil and penetrated basement schist at *ca* 5900 ft.

At Parentis production is *ca* 10,000 b.d., and 5 wells are producing. C. A. F.

1173. Gas field hit in Hungary. Anon. *Oil Gas J.*, 7.2.55, **53** (40), 88.—The discovery of a gas field in the Csomad area, 18 miles NE. of Budapest, is reported. Reserves are estimated at *ca* 35,000 million cu. ft.

The gas is compressed and shipped by rail to Budapest, whence it is pipelined across the Danube to the Obuda gas plant. C. A. F.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

1174. Vealmoor field—Borden and Howard Counties, Texas. H. C. McCarver. *Oil Gas J.*, 4.4.55, **53** (48), 195.—The geophysical case history of the Vealmoor field, Texas, is described. The field was discovered in 1948 following seismic surveys, and is an example of successful seismic mapping of a Pennsylvanian bioherm. Very few reflections are obtained from the reef, but the feature can be recognized by mapping the structural draping of the overlying Permian. Detailed seismic work and geological–geophysical co-operation are essential in successful exploration for this type of structure. C. A. F.

1175. Sandusky area, Grayson County, Texas. P. E. M. Purcell. *Oil Gas J.*, 4.4.55, **53** (48), 200.—The geophysical case history of the Sandusky (Oil Creek sand) field, Texas, is described. This discovery (in 1950) was the first of several important Ordovician and Pennsylvanian finds directly resulting from seismic exploration.

It is anticipated that seismic mapping will reveal further important fields in the Pennsylvanian and Ordovician of the area.

Seismic and structural maps are included. C. A. F.

PRODUCTION

1176. Pressure maintenance by inert gas injection in the high relief Elk basin field. F. M. Stewart, D. L. Garthwaite, and F. K. Krebill. *J. Petrol. Tech.*, 1955, **7** (3), AIMME Tech. Paper No. 4008, 49–57.—Elk basin produces from the combined Tensleep sandstone–Embar dolomite reservoir, which is 7 miles long and 2 miles wide, with dips averaging 21° on the W. flank and 45° on the E. The oil column was

2330 ft high. Permeability averages *ca* 100 mD, connate water 8%, and the initial pressure was 2234 p.s.i. at −400 ft. Increase in up-structure producing G.O.R. was noted in 1945. Extensive gravity drainage was suspected, and injection of flue gas from burning natural gas began in Sept. 1949 through 8 injection wells. Recently the rate of injection was 10,200 M.c.f/day, equivalent to 26,500 brl gas-cap space. Net injection has exceeded withdrawals by *ca* 2300 b.d., or 9·5%, and during 5 years gas cap pressure has risen by 195 p.s.i., while gas–oil ratio has remained near the soln ratio. It is estimated that 20,000 b.d. can be maintained 12 years longer than would otherwise have been possible, giving 24,000,000 brl more recovery. A theoretical recovery of 64% is calculated, while field performance suggests 66%. G. D. H.

1177. Direct calculation of bottom-hole pressures in natural gas wells. Y. K. Sukkar and D. Cornell. *J. Petrol. Tech.*, 1955, **7** (3), AIMME Tech. Paper No. 4010, 43–8.—The fundamental differential equation for fluid flow has been rearranged and integrated numerically, the kinetic energy term being neglected because it is negligible compared with the other terms for the case considered. The integration is rigorous except for the use of a constant average temp, and it is believed that this involves little loss in accuracy. Tables and graphs of the significant integral have been prepared, and the steps for calculating directly static or flowing bottom-hole pressures are set out. An example is given. G. D. H.

1178. Dimensionally scaled experiments and the theories on the water-drive process. G. A. Croes and N. Schwarz. *J. Petrol. Tech.*, 1955, **7** (3), AIMME Tech. Paper No. 4009, 35–42.—The experiments, simulating a linear flood, were carried out in tubes 1 m long, 6·2 cm dia, filled with 20–30 mesh sand which was initially saturated with water. Dist water was injected at $2{\cdot}05 \times 10^{-4}$ m/sec. Lub oil mixed with kerosine was used to vary the visc ratio from 1 to 500. The results are given as a diagram on which oil recovery and water–oil ratio are displayed as a function of total fluid production for various visc ratios.

If the Buckley–Leverett theory of displacement is applicable the model results should give the relation between relative permeability ratio and saturation with considerable accuracy. Dietz's theory agrees with the experimental data over a limited range, and it seems that the range would have been greater for wider tubes. G. D. H.

1179. Simultaneous influx of oil and bottom water to an incomplete well. I. A. Charnuii. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk*, 1955, (2), 27–40.—In oil deposits containing bottom water wells are usually perforated in the upper portion of the oil stratum, so as to draw off pure oil without water. This causes distortion of the water–oil interface in proximity to the well, forming a cone of bottom water. At small yields and correspondingly small depressions the cone is stable and the well yields dry oil. The theory of this effect and the method for calculating the limiting yield of dry oil have been previously considered. On increasing the depression above the limiting condition there occurs a break-through of bottom water into the incomplete well and a joint influx of oil and water commences; this case is considered in the present work. A general method for calculating yields is developed, which does not necessitate determination of the rise of water level along the well wall.

(Author's summary.)

1180. Effect of drain hole drilling on production capacity. B. L. Landrum and P. B. Crawford. *J. Petrol. Tech.*, 1955, **7** (2), 45–7.—Drain holes are lateral holes drilled to increase the oil drainage rate into the main well bore. Their influence on production has been examined in an electrolytic model in which vertical copper wire represented the main hole, with lateral wires representing the drain holes. Curves compare the increase in capacity with the number of drain holes and their lengths expressed as a fraction of the well's drainage radius. For a drain hole *ca* 0·2 of the drainage radius 1, 2, and 4 holes increased the well capacity by 0·8, 1·08, and 1·33, respectively. Roughly one long drain hole gives an increase equal to that of 4 drain holes of half its length.

The producing capacities of 10 California drain hole wells are compared with those of nearby wells, and the relative increases show fair agreement with the electrolytic model data. It is concluded that present drain hole completion techniques may cause little damage near the well bore. G. D. H.

1181. Well productivity increases from drain holes as measured by model studies. R. L. Perrine. *J. Petrol. Tech.*, 1955, **7** (2), AIMME Tech. Paper No. 4004, 30–4.—An electrolytic model using copper wire coated with platinum black has been used to examine the effect of drain holes on well productivity. The lengths, numbers, and arrangements of the "drain holes" were varied, and lucite cyl were placed around the "well" to simulate damaged formation near the well.

Large increases in productivity are possible only when there is damaged formation, and the drain holes reduce the effects of this. Otherwise an increase of *ca* 150% seems the max likely for the cases considered. The distance of penetration of the drain holes is of primary importance, and number of drain holes is secondary in importance to length. Multiple sand bodies may, however, be cases where the number of drain holes assumes greater importance. For holes going 40–60 ft from the well the arrangement of the holes has little effect. Length and total footage must be considered in assessing costs. Up to a point the increase in productivity is nearly proportional to the combined length of all drain holes drilled into the formation.

The effect of drain holes on decline rate, well spacing, and other factors has not been examined. G. D. H.

1182. Effect of slant hole, drain hole, and lateral hole drilling on well productivity. A. E. Roemershauser and M. F. Hawkins. *J. Petrol. Tech.*, 1955, **7** (2), 11–14.—An electrolytic model has been used to examine the effects of slant holes, drain holes, and lateral holes on well productivity. The well and holes were represented by copper wires in the electrolyte. The apparatus and methods are described, and the equipment was tested by comparing the results for a partially-penetrating well with Muskat's calculated values. Angular penetration gives *ca* 15% increase at 40°. Up to 3 drain holes the increase over a single fully-penetrating well was roughly proportional to the number of holes, but over that figure the rate of increase tailed off. The improvement was approx proportional to the amount of horizontal penetration. Lateral holes appeared somewhat less effective than drain holes. The experimental data may be applicable to homogeneous reservoir rocks. When the rocks are not homogeneous, lateral or drain holes might penetrate fractures or more permeable streaks, and so give better results than predicted on the basis of the experimental data. G. D. H.

1183. Economics of water flooding. L. L. Brundred. *J. Petrol. Tech.*, 1955, **7** (1), 12–17.—For water flooding the capital investment is high, rate of return is very slow, there is a time lag before results are obtained, and detailed engineering studies are essential. No 2 floods are alike. In the engineering study consideration must be given to the location of the pool, area, cost of acquisition, ownership, depth, type of reservoir and its characteristics, abandonments, primary recovery, availability of injection water, etc. Success is most likely in solution-gas drive fields; water drive fields are difficult, especially if water has moved up into the zones under consideration; in gas-cap fields it is difficult to prevent water entering the gas cap rather than the oil zone. Uniform permeability in the wells is desirable.

Engineering data permit the gross revenue to be estimated. Development costs may be $1500–$5000/acre, and operating costs over the life of the flood may be similar. Costs depend on, among other things, whether existing wells can be used, spacing, type of water plant, and whether the wells flow or are pumped. Closed water systems are cheaper than open systems. Pumping is believed to give shorter pay-out times. Costs of treated and pressurized water may range 1½–4 c/brl. Corrosion must be combated, and water flooding tends to

increase oil treatment costs. Selective plugging may be advantageous. Overall operating costs during the flood life may be $0·6–1·0/brl.

Experience is a most valuable asset in water flood work. Probably 7 out of 10 floods are failures for one reason or another, but probably only 2 of the failures are due to hidden factors. Failures may arise most often from lack of experience, shortage of working capital, and poor engineering.
G. D. H.

1184. Effects of extensive well fracturing on a water-flood operation in the North Texas Strawn sand. G. E. Roark and J. D. Lindner. *J. Petrol. Tech.*, 1955, **7** (2), AIMME Tech. Paper No. 4002, 16–21.—The Langston–Kleiner field produces from the Strawn at *ca* 3550 ft. It was developed in 1951 and 1952. The Strawn has 3 units, the middle one being the best, and the total sand diminishes to the W. and SE. Porosity averaged 15·2%, permeability 47 mD, and connate water 45·9%, according to capillary pressure measurements. At the time waterflooding began the cumulative production from the leases involved was 631,077 brl and the bottom-hole pressure had dropped from 1600 to 787 p.s.i., at which pressure the visc was 0·47 cP. The gas–oil ratio was *ca* 2500. In mid-1952 the wells were hydraulically fracture treated, and this was beneficial. The individual zones were separately treated. In some cases this caused a temporary reduction in gas–oil ratio and several pumping wells returned to flowing. All but one of the injection wells were specially drilled and fracture treated. The fracturing gave satisfactory injection rates through perforations or in open hole, and may have been effective where sand development was poor. Shooting and clean-outs have been eliminated. The break-through performance to date indicates no detrimental effect on sweep efficiency as a result of fracturing. There has been a lack of break-through over the major part of the flood area. Fracture treatments have employed 700–6000 lb sand and 700–6000 gal of oil.
G. D. H.

1185. A study of waterflood efficiency in oil-wet systems. J. E. Warren and J. C. Calhoun. *J. Petrol. Tech.*, 1955, **7** (2), AIMME Tech. Paper No. 4003, 22–9.—An understanding of the mechanism of displacement of oil by water needs to be supplemented by dimensional studies if lab data are to be applied in the field. A study of waterflood efficiency has therefore been made in terms of oil recovery at water breakthrough and on injection of 20 pore volumes of brine. The oil and water visc, core length, and rate of flooding were kept constant, and the contact angle, interfacial tension, permeability, and porosity were varied.

The cores were of Pyrex glass, rendered oil-wet by chemical treatment.

Interfacial tension, contact angles, porosity, and permeability were grouped into a scaling factor which correlates with break-through, and the same factors differently grouped correlated with recovery at 20 pore volumes throughput. It is concluded that with proper control a group of similar natural cores of small size can be used to indicate basic flooding performance.
G. D. H.

1186. Subsurface flowmeter. R. C. Rumble. *J. Petrol. Tech.*, 1955, **7** (3), 53–6.—The flowmeter, which is run on a wire measuring line and can pass through 2-inch tubing, consists of a rotameter flow-measuring assembly, coupled magnetically to a stylus, which records on a chart operated by a conventional sub-surface instrument clock. An inflatable packer (suited to the size of casing or liner) makes a seal between the casing and the tool, and thereby diverts all fluid through the meter. The meter is capable of measuring rates of 4–125 b.d. The device weighs *ca* 40 lb, is 7½ ft long, and with the packer in its sleeve is 1⅝ inch max dia. If the flow rate exceeds *ca* 160 b.d. the pressure drop across the flowmeter equals the pressure drop which the packer will withstand and fluid by-passes the packer. The device can be modified to measure injection rates.

In addition to lab tests the device has been used satisfactorily on 5 deep wells.
G. D. H.

OILFIELD DEVELOPMENT

1187. The Barrackpore–Wilson oilfield of Trinidad. G. E. Higgins. *J. Inst. Petrol.*, April 1955, **41** (376), 125.—This review of the Barrackpore–Wilson oilfield includes notes on the development, details of stratigraphy, logging characteristics of formations, and geological data, as well as information on the reservoirs, source of oil, drilling, coring practice, well logging, drilling muds, production, etc. Many maps and figures illustrate the article.
U. M.

1188. Oil in Italy and Sicily before the beginning of the 20th century. P. M. E. Schmitz. *Riv. Combust.*, 1955, **9** (5), 399–408.—Though superficial traces of the existence of oil and gas resources have been noticed in Italy for many centuries, the discovery of oil and gas in commercial quantities is very recent. The author traces the historical evolution of the information on oil and gas existing in Italy, from the most ancient times to the beginning of the twentieth century. The earlier operations of drilling, exploitation, and refining carried on in Italy in the second half of the nineteenth century and in the first years of the twentieth century are briefly described.
(Author's summary.)

TRANSPORT AND STORAGE

1189. Economic characteristics of fuel transportation. F. Beltrame. *Riv. Combust.*, 1955, **9** (4), 314–28.—After a brief survey of the impact of transportation in the distribution of fuels among the users, the author examines the different methods of transportation being adopted to move different fuels (coal, petroleum products, gas) with particular reference to economic factors. Some comparisons are made among cost of transportation referring to general cases and to industrial operations, whose economy is bound to the movement of fuels of different type.
(Author's summary.)

1190. Centrifugal compressors for gas pipelines. T. C. Heard. *Oil Gas J.*, 25.4.55, **55** (51), 123.—The procedure is outlined for the correct selection of centrifugal compressors to be driven by a combustion gas turbine for gas pipeline pumping. The article is illustrated by 7 curves.
G. A. C.

1191. Speed up flow calculations for design of gas gathering systems. O. Baker and W. Swerdloff. *Oil Gas J.*, 16.5.55, **54** (2), 148.—A simple, accurate, and rapid method is given for making gas-flow calculations. It gives an accurate solution to the general flow equation of the U.S. Bureau of Standards Monograph 6. Charts are given.
G. A. C.

1192. Blends products in pipeline. R. Lowe. *Petrol. Refin.*, 1955, **34** (4), 149–52.—This article describes a system by which petroleum products are automatically precision blended as they enter the pipeline. The system was designed so that each component was individually regulated to maintain a fixed percentage of the total flow, while the total flow was itself automatically regulated to match the variable intake requirements of the pipeline. A significant contribution of this system is the fact that no tankage is required beyond the run-down tanks and the labour saving obtained by elimination of tank gauging, manual switching, and pump attendance when compared with ordinary batch blending processes.
R. L. R.

1193. When stronger line pipe is needed, pipelines will get it. A. B. Wilder. *Oil Gas J.*, 9.5.55, **54** (2), 130.—New developments are described in the pipeline industry, including production of seamless cold expanded pipe in sizes 16–26-inch o.d., and a pipe T-1 brand steel.
G. A. C.

1194. 30° pipe bevel best for pipelines. L. J. Cunningham and S. V. Williams. *Oil Gas J.*, 30.5.55, **54** (4), 70.—Recent API standards call for 37½° bevel on pipeline ends, although 30° bevel has satisfactorily been used for years. Tests by Northern Natural Gas Co, Omaha, have shown that the smaller bevel results in a better weld and in less welding time, with a big saving in welding metal. G. A. C.

1195. 295-mile looping program completed. S. A. Bergman. *Oil Gas J.*, 16.5.55, **54** (2), 164.—The Panhandle Eastern Pipeline's third main from Kansas through Ohio and Michigan is described, which raises system's peak delivery to 1,070,000 M.c.f. daily. G. A. C.

1196. Construction of the Sui-Karachi gas pipeline. Anon. *Fluid Handl.*, 1955, 93–6, 125–8.—Political and financial background to supplying of Sui natural gas to domestic and industrial users in Karachi and intermediate centres is mentioned. Placing of contracts and supplies of materials are described. Details of construction, protection, and routing are given, with special mention of river and rail crossings. 350-mile line will handle 74 million cu. ft. of gas/day and later, as demand increases, 110 million cu. ft/day by bringing in 2 booster stations. B. S. W.

1197. Aircraft hydrant fuelling. Anon. *Fluid Handl.*, 1955, 148–50.—Construction and operation of novel installation at Southampton airport consisting essentially of 12,000-gal storage tank and underground pipeline to 7 delivery hydrants on servicing apron. Fuel transferred to aircraft from hydrant via small dispensing trolley containing air separator, microfilter, and meter. B. S. W.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

1198. Refinery plant manufacture. W. G. Elgie. *Petrol. Times*, 29.4.55, **59** (1506), 407.—The engineering maintenance system at the Kent refinery of the British Petroleum Co is described. An inventory is made and kept of all equipment, and several thousand plant records and history cards are necessary with the large amount of equipment to be dealt with at the plant. Typical index cards, request sheets, and organization diagrams illustrate the article. G. A. C.

1199. Maintenance and instrument short cuts. F. L. Resen. *Oil Gas J.*, 2.5.55, **53** (52), 103.—Heat exchanger maintenance is described on the Magnolia Oil Co's cycling plant, Texas. Maintenance is speeded up by using knockdown scaffolding and a special frame for pulling tube bundles. G. A. C.

1200. Large motors need special protection. S. B. Hoag. *Chem. Engng*, 1955, **62** (5), 187.—The problems peculiar to the operation of electric motors above 200 h.p. are discussed. Protection against various ambient conditions, corrosive, flammable, abrasive, and electrically conductive, is discussed and tabulated for easy reference. D. J. S.

1201. Some modern submersible pumping applications. Pt II. W. L. Gardiner. *Brit. Petrol. Equipm. News*, 1955, **4** (4), 45–8.—Following Pt I, irrigation pumps are discussed, and the application of submersible pumping in the forced-circulation type of high-pressure boiler. 2 detailed illustrations of these pumps appear. E. A. G. H.

1202. Determining operating pressures in a closed products system. F. C. Hangs. *Oil Gas J.*, 2.5.55, **53** (52), 100.—A graphic method is described for determining pressures for specific rates of flow in 2 cases. G. A. C.

1203. Pin-fin heat-exchanger surfaces. W. M. Kays. *Trans. Amer. Soc. mech. Engrs*, May 1955, **77** (4), 471.—This paper summarizes the available test data on compact pin-fin heat-exchanger surfaces, including both heat-transfer and flow-friction performance. Consideration has been restricted to in-line pin arrangements. It is shown that the circular pin fin provides one method for obtaining very high heat-transfer conductances while at the same time maintaining high fin effectiveness. 11 literature refs and a discussion on the paper are included. U. M.

1204. New tower packing shows high throughput. Anon. *Chem. Engng*, 1955, **62** (5), 126.—A new mesh tower packing has been developed for use in large scale separation of hydrogen isotopes by dist of water. The packing is claimed to be low in cost, with high efficiency and high capacity. Details of construction are given and results of performance tests are reported. D. J. S.

1205. How to calculate multi-draw towers. N. H. Prater and C. W. Boyd. *Oil Gas J.*, 2.5.55, **53** (51), 72.—The principles of close separation are adapted to multi-draw crude oil fractioning towers, and a 21-step procedure for stepwise calculation is given.

The Fenske method of obtaining minimum number of trays of total reflux, the Scheibel–Montross one for calculating minimum reflux rate, and the Gilliland correlation between reflux rate and the number of theoretical trays are used.

Tables given include composition and properties of the fractions, and heat balances. G. A. C.

1206. How to size future process vessels. A. H. Younger. *Chem. Engng*, 1955, **62** (5), 201.—The sizing of vapour–liq separators, accumulators, and knock-out drums is described. D. J. S.

1207. Proportioning pumps in pilot plants. — de Hey, — Lagerwey, and — Sterkman. *Ingenieur, 's Grav.*, 15.4.55, **67** (15) Ch. 17–6.—Proportioning pumps must meet exacting requirements as regards construction and suitability to work under a great variety of conditions. As the number of types has to be kept as small as possible, the Koninklijke/Shell Laboratory, Amsterdam, developed a "Standard" proportioning pump of the plunger type. 4 pumps are driven by one motor, and the plunger strokes are individually adjustable. The choice of materials is discussed. Constructional details of a membrane pump for liq HF are also included. 10 figs. G. F. T. C.

1208. The control of water pollution from refinery residue. G. E. Villar. *Rev. Combust.*, 1955, **9** (5), 462–86.—The petroleum refinery industry may be considered one of the main sources of water pollution. An account is given of noxious products present in effluent liq streams, of the damage they cause, and of different purifying processes and operations. The essential anti-pollution conditions which refinery effluents discharging in public waters must satisfy are then discussed. (Author's summary.)

ABSORPTION AND ADSORPTION

1209. How weather affects design of a natural gasoline plant. J. B. Tayloy. *Oil Gas J.*, 30.5.55, **54** (4), 76.—The Tioga, N. Dakota, natural gasoline plant belonging to Signal Oil and Gas Co is described. The climate is variable and extreme, from −30° to +100° F, and the severe winter conditions necessitate a dry plant. The gas is dehydrated before absorption, throughput design is for 65 M.Mc. of field gas at 750 p.s.i. G. A. C.

SOLVENT EXTRACTION AND DEWAXING

1210. Solvent extraction of lube oils. J. C. Reidel. *Oil Gas J.*, 30.5.55, **54** (4), 95.—Efficient operation in solvent extraction at Kansas City refinery of Phillips Petroleum Co depends on

careful selection of crudes and feed preparation in a 2-stage volume unit. A 2-stage propane de-asphalting step is employed, and a 90-ft phenol tower provides more contact stages than is usual. G. A. C.

CRACKING

1211. Houdresid converts crude residue into profitable products. J. C. Dart, G. A. Mills, A. G. Oblad, and C. C. Peavy. *Oil Gas J.*, 9.5.55, **54** (2), 123.—A new moving-bed process at Sun Oil Co, Sarnia, is described, for converting a wide range of feed stocks into high quality dist. The process uses either natural or synthetic cat with equipment similar to that employed in conventional cat cracking. G. A. C.

1212. Improving distillate fuels by hydrofining. W. J. Zimmerschied, H. A. Hunt, and W. A. Wilson. *Oil Gas J.*, 23.5.55, **54** (4), 113.—A high-sulphur W. Texas crude oil is improved in quality to equal that of Mid-Continent dist with no loss of liq product by hydrofining. Desulphurization is practically complete, giving a sweet product with improved smoke point. G. A. C.

1213. Kinetics of the coking of petroleum asphaltenes. A. M. Brodskii, K. P. Lavrovskii, and E. D. Filatova. *Invest. Akad. Nauk. S.S.S.R., Otdel. Tekh. Nauk*, 1955, (1), 141–4.—Asphaltic residue (25%) obtained by C_5H_8 de-asphalting of 50% bottoms from Romashinsk crude was purified by twice reprecipitating (with intermediate soln in C_6H_6) from C_5H_{12}, yielding material with C.R. (Con) 67·5%. This was dissolved (20 and 37 p.p.m., concn determined by optical density) in thiophene-free C_6H_6 (verified to be inert under test conditions). Soln was passed through quartz tube at *ca* 700° C and asphaltene content of condensate measured. Results indicate that gas-phase coking of asphaltenes is bimolecular reaction, reaction rate increased by 1·7 times on temp rise from 715° to 765° C. Mol. wt. of 1300 was assumed; activation energy of reaction calc as *ca* 21 k.cal/mol. V. B.

1214. Stop pollution by nitrogen oxides. M. S. Peters. *Chem. Engng*, 1955, **62** (5), 197.—One process that produces nitrogen oxides as waste is the regeneration of cracking cat. The waste gas oxide content must be below 0·2% by volume. The damage caused by pollution is discussed, and methods of removing oxides of nitrogen are described. 4 towers are described, and procedure for each is discussed. D. J. S.

HYDROGENATION

1215. Production of ammonia, methanol, and liquid fuels by catalytic hydrogenation. M. Pier. *Riv. Combust.*, 1955, **9** (5), 409–16.—A survey is made on the development of the production of ammonia, methanol, and liq fuels by high-pressure cat hydrogenation of different raw materials. The present situation in this field is discussed. Particular reference is made to research carried out in order to develop cat of high selectivity for the type of process, from the earlier studies of Nernst in 1... to the more recent ones, which have led to the production of cat to be employed for the desulphurization of crude oils by high-pressure hydrogenation. (Author's summary.)

CHEMICAL AND PHYSICAL REFINING

1216. Why M.E.A. solution breaks down in gas-treating service. L. D. Polderman, C. P. Dillon, and A. B. Steele. *Oil Gas J.*, 16.5.55, **54** (2), 180.—Research at the Mellon Institute on why some gas-treating plants have serious problems with corrosion and soln contamination has shown that M.E.A. can be converted to 2 other degradation compounds which do not accept acid gases. Soln deterioration, the degradation products, effect on operation, and lab corrosion studies are discussed. Use of side stream dist equipment effects removal of unwanted products. G. A. C.

1217. What not to do with Dowtherm systems. W. L. Badger. *Chem. Engng*, 1955, **62** (5), 192.—A set of 11 case histories of mistakes in the use of Dowtherm is given, and the error in each is pointed out. It is claimed that very few failures have occurred in Dowtherm systems. D. J. S.

SPECIAL PROCESSES

1218. Aromatization processes in the petroleum industry—production of pure aromatic hydrocarbons. N. R. Capdevila. *Combustibles (Zaragoza)*, 1954, **14**, 235–48.—Review of aromatics production from petroleum in the U.S.A. during the past 6 years, aromatization reactions from naphthenes and paraffins, cat employed, and some of the industrial reforming processes currently in operation (platforming, fixed and fluid hydroforming). 80 refs. A. C.

1219. New dry-furnace carbon-black process. W. H. Balka. *Oil Gas J.*, 9.5.55, **54** (2), 120.—The Lynn automatic furnace process, primarily a gas-feed one, but using oil in conjunction, is described. 4 reactions take place, in the burners, dissociation and cracking zone, and in the primary cooler. Plant costs are *ca* 30% less per pound of carbon black recovered than conventional furnace-type plants. The history of carbon black manufacture, including ink, rubber, and oil blacks, is also given. G. A. C.

1220. Destrehan fluid hydroformer today. R. D. Ferrell, J. R. Tusson, and H. A. Parker. *Petrol. Refin.*, 1955, **34** (4), 121–4.—The first commercial fluid hydroformer put in operation in 1953 has been tested for a wide range of process variables. These tests have shown that gasoline yield, cat activity, cat activity maintenance, and low cat attrition rates predicted from pilot plant work have been either equalled or surpassed in the commercial operation. A complete description of the plant is given, together with details of special equipment that has been added to the original design based on operating experience. R. L. R.

1221. Urea complexes. W. G. Domask, K. A. Kobe, and L. C. Fetterly. *Petrol. Refin.*, 1955, **34** (4), 127–37.—A new process using urea complexes known as extractive crystallization, which can be used to separate normal paraffin from branched ones, is described in 2 articles.

In the first, the general properties of the urea complexes are given, together with a discussion on the conditions of formation and decomposition.

The second paper surveys the industrial application of the process which has already established a place in lab operations for separation, purification, and analysis. Pilot plant studies are beginning to show that the normal paraffins in the heavy gasoline range and higher can be removed economically from petroleum fractions by this method. R. L. R.

1222. Rexforming. H. W. Grote, V. Haensel, and M. J. Sterba. *Petrol. Refin.*, 1955, **34** (4), 116–20.—A new process for the production of fuels with over 100 clear octane. This necessitates the use of a solvent extraction technique with recycle of low octane materials which do not appear in the final product, a water-white gasoline of controlled volatility characteristics.

Due to the mild platforming operations, side reactions are avoided and cat life extended, giving a very good overall yield of gasoline with an octane rating in the region of 95–102.

The process consists of a feed refractionator, a side cut of which is fed to the reactor, which is similar to a standard Platformer unit. The reactor effluent after cooling passes to a separator, after which it is stabilized and then fed to the extraction unit, which rejects low octane material from the top for recycle.

Test data from lab and pilot plants are given and estimated costs for a full scale plant tabled. R. L. R.

1223. Design and operation of a fluid catalyst pilot plant for Fischer–Tropsch synthesis. C. C. Hall and A. H. Taylor. *J. Inst. Petrol.*, April 1955, **41** (376), 101.—A description is given of the Fuel Research Station pilot plant which was designed for a throughput of fresh feed gas up to 2500 cu. ft/hr.

(s.t.p.), operating pressures in the range 20–50 atm, and reaction temp up to 340° C. Parts of the plant coming into contact with condensing products were in 18/8/1 stainless steel, all other parts in mild steel. The feed gas was obtained by blending blue water-gas and hydrogen from the steam-iron process, both gases purified to remove H_2S. A simplified flow sheet and design and operational details of the main items of equipment are given. An alkali impregnated mill-scale cat was used. The results obtained in 2 test runs of 14 and 30 days duration are reported and discussed.

Discussion on the paper and 14 literature refs are included. U. M.

1224. Research on the Fischer–Tropsch synthesis at the British Fuel Research Station. C. C. Hall. *Riv. Combust.*, 1955, **9** (5), 365–98.—A long account of the British research, at the Fuel Research Station, on the Fischer–Tropsch synthesis. The research, commenced in 1935 with a view to the study of the production and properties of olefin-polymer lub oils, turned during the war towards the study of the Fischer–Tropsch synthesis, which was envisaged as an industrial process for the production of liq fuels, lubricants, waxes, and chemical products. During the past few years the work has been concerned with iron cat, fluid cat, and the mechanism of the synthesis reaction. (Author's summary.)

PRODUCTS

CHEMISTRY AND PHYSICS

1225. Chemical engineering fundamentals: interpretation of kinetic data—II. T. E. Corrigan. *Chem. Engng*, **62** (5), 203.—Following an article on the use of initial rates of conversion in the interpretation of kinetic data, the use of finite rates is discussed. 5 methods of using the data are shown, and a method of checking the final rate equation is given. Simultaneous reactions are discussed, and there is a general summary. D. J. S.

1226. Liquid–liquid equilibria of ternary systems consisting of two hydrocarbons and a solvent. Y. L. Gladel and J. Durandet. *Rev. Inst. franç. Pétrole*, 1955, **10**, 258–61.—List supplementing that previously published (*cf* Abs. **1647**, 1954); 108 equilibria involving 25 different solvents, literature surveyed to July 1954. V. B.

1227. Solids–gas contacting. R. E. Vener and L. A. Robinson. *Chem. Engng*, 1955, **62** (5), 163.—A report on solids–gas contacting as a unit operation is given. The fundamental factors in a variety of processes are given, and each process is reviewed briefly. A second part of the article deals with commercial equipment for solids–gas contacting. The equipment dealt with includes spray, rotary, tunnel, and tray equipment, and the various fixed- and moving-bed devices are described. A detailed report on moving-bed contactors is to follow. D. J. S.

1228. Properties of olefins—preparation and crystallization of mercuri-propanol propionate. J. L. Martinez Cordon. *Combustibles (Zaragoza)*, 1954, **14**, 229–34.—Compound described in the literature for the first time; it was prepared in the course of attempting to find better methods of estimating olefin content of hydrocarbon mixtures such as gasoline, kerosine, etc. Preparation by passing propylene gas through suspension of yellow HgO in 1 M propionic acid, filtering off excess HgO, and evaporating under vac. Yellow viscous liq is obtained, formula $CH_3{\cdot}CH_2{\cdot}COOHg{\cdot}CH_2{\cdot}CHOH{\cdot}CH_3$. Crystallization is only possible from completely anhydrous acetone–ether. Conversion to bromo-mercuri-propanol and analyses of both compounds is described. A. C.

1229. The sound velocity in branched hydrocarbons. H. Geelen, H. I. Waterman, J. B. Westerdijk, and R. F. Klaver. *Riv. Combust.*, 1955, **9** (5), 355–64.—Sound velocity has been determined of all the heptanes and octanes, as well as certain derivatives of *cyclo*hexane. The method proposed by Taylor, Pignocco, and Rossini permits the establishment of correlation between molar sound velocity and mol structure. (Authors' summary.)

ANALYSIS AND TESTING

1230. The solubility of water in 1-butene. W. B. Brooks and J. J. McKetta. *Petrol. Refin.*, 1955, **34** (4), 138.—The solubility of water in 1-butene was determined experimentally at pressures to 1000 p.s.i.a. and temp up to the critical temp of 1-butene, 219° F. In an earlier paper (*Petrol. Refin.*, 1955, **34** (2), 143) the solubility of 1-butene was presented, and this article compares these data with the solubility of water in propane and *n*-butane. R. L. R.

1231. Preliminary communication. Quantitative estimation of low-molecular acids in coal oxidation products. A. Benning. *BrennstChemie*, 1955, **36** (7–8), 120.—Brief description of a paper-chromatographic method for estimating low-mol benzenecarboxylic acids in the mixture from HNO_3-oxidn of coals. Details will appear later. R. T.

1232. Vacuum flashing. G. A. Filak, H. L. Sandlin, and C. J. Stockholm. *Petrol. Refin.*, 1955, **34** (4), 153–7.—A discussion on the methods of estimating the quantity of materials that will be vaporized in a flashing chamber. 4 of the best known methods are given, being compared with each other and experimental tests made on conventional plant equipment. Every precaution was taken to keep the experimental error well within the limits of normal fluctuations encountered in routine refinery operations. The data are presented by means of graphs showing percentage differences between observed and estimated flash, thus comparing both different correlations and the experimental data. R. L. R.

ENGINE FUELS

1233. Diesel fuels. V. Berti, C. Padovani, C. Paleari, and C. Siniramed. *Riv. Combust.*, 1955, **9** (5), 435–61.—2 series of diesel fuels, straight run dist and cracked (thermal and cat) fractions, from different crudes, have been examined. Physical properties and engine behaviour of the above products have been correlated with chemical composition as determined by the *n–d–M* method. Sensibility of the different fuels toward the addition of ignition improver (amyl nitrate) has been investigated. Experimental data collected have confirmed the favourable effect of paraffinicity on ignition qualities, and the depressing influence of cyclic components (in particular condensed-ring components) both on cetane no. and on response to ignition improvers. Ignition qualities and response to addition of improvers, excellent in straight run dist from Middle East crudes, are less good in straight run dist of naphthenic and naphthenic–aromatic nature: the above qualities are absolutely insufficient in the cat cracked gas oils, whose qualities are further depressed by the poor stability and by high sulphur content. (Authors' summary.)

GAS OIL AND FUEL OIL

1234. Phenomenon of ejection of burning liquid during combustion. V. I. Blinov. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk*, 1955, (2), 122–31.—Tests were made with petroleum products (kerosine, gas oil, transformer oil) burning on water in small lab apparatus (illustrated). Temp distribution through burning liq was determined. Experiments included sprinkling of various materials (*e.g.* cork powder) on water surface and use of boiled (*i.e.* air-free) water. Results indicate that with air nuclei present water layer commences boiling at 100° C, causing foaming and lowering of temp of burning oil. In absence of dust, and when previously boiled, water can become superheated, with consequent ejection of

burning liq when sudden vaporization eventually occurs; in burning tanks ejection cannot occur in absence of water layer (*cf.* Abs. **1925**, 1950). V. B.

1235. Oil-fired geared steam shunting locomotive. Anon. *Engineer, Lond.*, 1955, **199**, 628–9.—Oil firing has been introduced into a new design of 0–6–0 steam shunting locomotive by Sentinel (Shrewsbury) Ltd. 11 locomotives are under construction, each of 200 h.p., weighing 50 tons and having a starting tractive effort of 26,000 lb. The boiler has an evaporative capacity of 5500 lb/hr at 275 p.s.i. and 750° F. Light fuel oil is used when first lighting the burner. The main heavy fuel tank is 300 gal capacity, fitted with thermostatically controlled steam heating, and is sufficient for 24 hr operation. A. C.

LUBRICANTS

1236. Progress in the art and science of lubrication I, II. E. V. Paterson. *Petrol. Times*, 13.5.55, **59** (1507), 540; 27.5.55, **59** (1508), 599.—Review of the developments in the lubrication field made during the last year. Low visc and multi-graded oils are discussed and the question of revision of the SAE specifications mentioned. Synthetic lubricants such as molybdenum disulphide and "Lube-lok" (graphite–molybdenum disulphide in a resinous binder) are dealt with. Advances in methods of inspection of H.D. lub oils and in lub equipment are mentioned. The Sulfinuz process is briefly dealt with, as are frictional properties of lubricants and metals at high temp and speeds, and the problems of running-in engines with additive oils. C. B.

1237. The chemist faced with lubrication problems. G. Hugel. *Riv. Combust.*, 1955, **9** (5), 417–34.—The relationships of chemical composition to E.P. activity of organic sulphur compounds have been established. Experiments of lubrication under E.P. conditions have been carried out in the Faville testing machine. It has been established that chemical reactions take place between metal surfaces and active substance employed as E.P. additives. Lubrication phenomena are considered by the author as being mainly of microscopic order, and disgregation of metal surfaces plays a fundamental role. (Author's summary.)

1238. Effect of viscosity of car-journal oils on running temperature and other characteristics of journal-bearing performance. W. M. Keller. *Trans. Amer. Soc. mech. Engrs*, April 1955, **77** (3), 385.—Lab test equipment has made it possible with controlled conditions to isolate the oil as a variable and obtain reliable data on the optimum visc for oils in the journal box. With full hydrodynamic lubrication the asperities of journal and bearing are separated by an oil film; under these conditions the heat developed in a journal box is from 2 sources, the pressure of the waste against the bottom of the journal and the viscous shear of the oil film between bearing and journal. A discussion on the paper is included. U. M.

1239. Oil film extent in complete journal bearings. J. A. Cole and C. J. Hughes. *Engineer, Lond.*, 1955, **199**, 555–7.—About 60 photographs are presented of oil film extent in complete 1-inch dia glass bearings under varying conditions of speed (up to 5000 r.p.m.), load (up to 200 p.s.i. of bearing projected area), and oil feed pressure (up to 26 p.s.i.). Lub used is light mineral oil, visc 6 cP at 60° C, made to fluoresce by U.V. radiation. Effects of changing oil entry system from single hole to axial and circumferential grooves are shown, also effect of changing bearing length–dia ratios. Under conditions of high speed and low load film is practically complete, otherwise indications are that full width film begins and finishes later than is assumed in conventional theory. A. C.

1240. Properties of chlorofluorocarbon oils. Anon. *Industr. Chem. Mfr*, 1955, **31**, 271–2.—Chlorofluorocarbon ("Florube") lubricants are now being manufactured to the extent of a few tons p.a. Their most important feature is outstanding resistance to chemical attack, especially by oxidizing agents, *e.g.* fuming nitric acid at 90°–95° C or chlorine at 150° C. V.I. comparable to hydrocarbon oils, not as good as V.I. of silicones. Good boundary lubrication and E.P. properties. Approx mol. wt. 600, typical composition 22% C, 32% F, 46% Cl. Electrical properties (p.f., resistivity, breakdown voltage) equal to or better than a good transformer oil. Expected application in lubrication of valves, gland packings, pumps, and fans handling reactive materials, and elsewhere where inertness, non-inflammability, or good electrical properties are required (*cf.* Abs, **1123**, 1955). A. C.

1241. Vacuum's new Birkenhead grease plant. Anon. *Gas Oil Pwr*, 1955, **50**, 69.—Brief description of a grease plant with associated pilot plant which began production in June 1954. H. C. E.

1242. Grease manufacture at Birkenhead. Anon. *Petroleum, Lond.*, 1955, **18** (5), 165–9.—A new plant completed in 1953 produces between 1500 and 2000 tons/week of some 200 different greases. Saponification is carried out in "Stratco" contactor heaters, the final grease being manufactured in kettles. J. B. S.

BITUMEN, ASPHALT, AND TAR

1243. Alkali lignin as emulsion stabilizer. W. A. McIntosh and J. J. Keilen. *Rds & Str.*, 1955, **98** (4), 150.—The use of alkali lignin as a bitumen stabilizer has increased recently in the U.S.A. Indulin C is one type, and details of its properties and those of emulsions made with it, are given. It acts not only as a stabilizing agent, but also as a sequestering agent in preventing calcium salts present from decomposing the soap emulsifier. R. H.

1244. Current practice in asphalt manufacture. Anon. *Industr. Chem. Mfr*, 1955, **31**, 252–3.—This article refers to production of mastic asphalt from bitumen, rather than manufacture of bitumen itself. Mastic asphalt is in increasing demand for covering ships' decks, walls of below-ground storeys of buildings, and floors. Bituminous substances were melted sufficiently in horizontal cyl mixer, limestone and other inorganic ingredients (*e.g.* iron oxide or waste bauxite for coloured mastics) added, heating and mixing continued for 6–8 hr. Mastics were cast into blocks when "cooking" completed, handling of these was largely mechanized by fork-lift trucks. A. C.

SPECIAL HYDROCARBON PRODUCTS

1245. Breakdown strength of insulating oils. J. Claussnitzer. *Deutsche Elektrotechnik*, 1954, **8**, 274–6.—Tests (1·5 mm gap) on oil purified by spraying into vac (5–10 mm) in 5-ton elec heated (85° and 55° C) vats. Vac alone can cause marked improvement in dielectric strength, with heat improvement is linear for first 6–8 hr, after which there is a fall, followed by subsequent rise back to max val of *ca* 200 kV/cm. Curves of dielectric strength against time of treatment are given, as latter increases scatter of result diminishes. Concluded that treatment temp of 50° C (in place of 90° C) is adequate and economizes 65% power and 40% time. Literature (mainly German) is reviewed. 18 refs. V. B.

DERIVED CHEMICAL PRODUCTS

1246. Direct oxidation of ethylene to ethylene oxide. R. Landau. *Industr. Chem. Mfr*, 1955, **31**, 233–6.—Comparison of the advantages to be gained in production of ethylene oxide by using direct oxidn process developed by Scientific Design Co, N.Y., as compared with indirect process via ethylene chlorhydrin. Direct vapour phase process uses air rather than oxygen, operates at pressures above atm on a recycle system, gives yields above 60% of theoretical, product purity higher than in the chlorhydrin process, employs a commercially successful cat, and does not suffer corrosion. Production cost less than via chlorhydrin, latter process operates with marginal profit. A. C.

1247. Ketones from petroleum. L. F. Hatch. *Petrol. Refin.*, 1955, **34** (4), 160–4.—The article deals with the general methods of ketone production with special reference to acetone production by means of oxidn of cumene, dehydrogenation, and the OXO reaction using ethylene. The chemical properties of the ketone are discussed with particular reference to the carbonyl group, condensation, and replacement of carbonyl oxygen by halogen or ammonium derivatives.

The partial oxidn of paraffin hydrocarbons with relatively high pressures and low temp is also dealt with and a brief explanation is given of the chemical reactions involved and the use of side reaction products. R. L. R.

1248. How plant size affects unit costs. S. C. Schuman. *Chem. Engng*, 1955, **62** (5), 173.—A quantitative analysis of the production costs of an "average" chemical for various sizes of plant is given. The calculated selling price is obtained by summing a series of correlations of each unit cost, and is compared with the average. D. J. S.

COAL, SHALE, AND PEAT

1249. Potassium absorption of residual coals. C. Kröger and W. Ruland. *BrennstChemie*, 1955, **36** (7–8), 97–103.—Pyridine extracts of striated coals of varying rank are examined for K absorption in comparison with graphite. Kinetic examination of the absorption phenomenon, estimation of metallic and chem-combined K, and comparison of roentgenograms of residual coal and K-adducts are presented. The coherent lattice regions exhibit no graphite nuclei, but a network structure of polycondensed aromatic lamellæ with effective, partly parallel groups. 18 literature refs. R. T.

1250. Humine development from lignified materials from cellulose to anthracite. A. Gillet. *BrennstChemie*, 1955, **36** (7–8), 103–20.—Humines are defined as non-vol, generally insol products of natural conversions of ligno-celluloses and certain products of artificial conversion of these natural materials. Based on researches and the course and mechanism of org reactions, the successions of percentage elementary compositions of the humines are presented in triangular diagrams. Hypothetical structural formulæ represent these developments from cellulose to the final limit anthracite, over dopplerite, peat, lignin, brown coal, pitch coal, gas-fat coal, coking coal. The differences between the formulæ for these substances represent quantitatively the No. of atoms of the elements eliminated in the geological period. 28 literature refs. R. T.

CORROSION

1251. The use of inhibitors against corrosion. C. Bombara and F. Gianni. *Riv. Combust.*, 1955, **9** (4), 297–313.—Among the chief means currently used in the petroleum industry to mitigate corrosion, inhibitors (organic and inorganic) play a big part, since they are now being used on a relatively large scale. From the practical standpoint it is possible to evaluate inorganic inhibitors by means of galvanic polarization curves. In a series of common inhibitors tested in galvanic (copper–iron) cells containing a sodium chloride soln, potassium nitrite and dichromate have shown outstanding effects on the others. Only by means of nitrite is it possible to inhibit completely electrolytic corrosion in presence of chlorides.

(Authors' summary.)

1252. How Richfield tackled hydrogen blistering. B. W. Neumaier and C. M. Schillmoller. *Oil Gas J.*, 23.5.55, **54** (3), 107.—An account is given of methods used by Richfield Oil Corpn to prevent low-temp hydrogen attack at its new Wilmington, California, fluid unit, in which there are 2 vulnerable points, viz. the towers and overhead equipment of the diethanolamine stripper and the sour-water reclaimer. H_2S is absorbed in a diethanolamine soln, and caustic washing and feed drying protects overhead equipment. Facilities are provided for adding polysulphide and inhibitor when required. G. A. C.

1253. The use of additives for the prevention of low-temperature corrosion in oil-fired steam-generating units. E. C. Hugo and E. C. Piotter. *Trans. Amer. Soc. mech. Engrs*, April 1955, **77** (3), 267.—Low-temp corrosion is caused by the presence of SO_3 in the combustion gases which combines with water vapour and forms H_2SO_4 on the cooler surfaces of the unit. Various ways of combating this condition are discussed, with particular emphasis on the use of dolomite as a fuel oil additive. Test data and results of operating experience are presented which show that additives are effective in reducing the amount of acid formed and, in some cases, in practically eliminating cold-end pluggage and corrosion. The economics of use of additives and design of units for higher efficiency when using additives are also discussed. 10 literature refs and a discussion on the paper are included. U. M.

1254. Influence of fine particles on corrosion of economizer and air-preheater surfaces by flue gases. P. Hodson. *Trans. Amer. Soc. mech. Engrs*, April 1955, **77** (3), 279.—Fine particles, consisting of unburned fuel and ash spheres, are those of less than 10 μ dia; they have a very large relative surface area which tends to accelerate any reaction as well as increasing their ability to adsorb another substance. They increase the reaction rate as well as the condensation temp and rate, and can attain a temp lower than that of the gas stream by radiation and are good condensation nuclei. A qualitative test of the formation temp, extent, and nature of deposits from cleaned and dirty gas showed that deposits tend to build up in a narrow range and that cleaning the gas greatly decreases the rate of deposit build-up. 12 literature refs and a discussion on the paper are included. U. M.

SAFETY PRECAUTIONS

1255. Automatic fire protection. E. E. Taylor and L. J. Fast. *Oil Gas J.*, 23.5.55, **54** (3), 141.—The system, installed in 2 gas turbine stations in the desert west of Blythe, California, includes automatic shut-down devices and a water-spray fire system. G. A. C.

MISCELLANEOUS

1256. Some sidelights on petroleum's economic progress. C. O. Willson. *J. Petrol. Tech.*, 1955, **7** (3), 14–18.—It is argued that U.S. domestic oil demands will be 70% up over the next 20 years and amount to *ca* 13×10^6 b.d. in 1974. Using a proved reserves–current production ratio of 13, the proved U.S. reserves should then be $62{\cdot}5 \times 10^9$ brl; the present figure is 36×10^9 brl. The requirements for the 20-year period will be 78×10^9 brl, and if 13½% is met by imports, the country must find 94×10^9 brl of oil and natural gas liq in the next 20 years. Since 1859 consumption plus discoveries total 81×10^9 brl.

51,750 wildcats have added reserves of $7{\cdot}9 \times 10^9$ brl in the last 5 years.

Marketed gas consumption exceeds 9×10^{12} cu. ft/year,

the oil equivalent being over 4,000,000 b.d. Oil and natural gas are becoming increasingly competitive.

Car engine C.R. are increasing, the higher values requiring 91–98 octane fuel.

In 1954 U.S. production averaged 6,330,000 b.d. and foreign non-Communist areas 5,856,000 b.d. 22% of the 164×10^9 reserves were in the U.S.A. and 6% in Russian dominated areas. 491,509 wells in the U.S.A. averaged 136 b.d., and 540 wells in the Middle East 5000 b.d.

Product pipelines, natural gas liq, the need for more highways, U.S. imports, and international companies are also discussed. G. D. H.

1257. Economics of the international petroleum industry. A. H. Chapman and J. T. Duce. *J. Petrol. Tech.*, 1955, **7** (3), 9–13.—In spite of gloomy predictions, sometimes based on faulty interpretations, the oil industry has found enough oil for current needs, and the immediate future seems to be covered in spite of the rapidly growing demands. Based on Putnam's book on "Energy in the future," it is calculated that in 1970 oil and gas will have attained their peak as a percentage (27%) in total world energy needs, and nuclear power will be becoming appreciable. In 2050 oil and gas will supply 10%, coal 15%, and atomic energy 60%. However, the 1970 oil and gas equivalent will be 20,500,000 b.d. and in 2050, 120,000,000 b.d. At the end of 1953 the cumulative equivalent oil and gas consumption was 98×10^9 brl, while reserves were placed at 188×10^9 brl, which would supply needs till 1980. Assuming twice 1950 costs to act as a limit, it is estimated that crude oil, gas, tar sands, and shale oils represent probable supplies of 148×10^{10} brl, and these are estimated to meet demands to 2041. Putnam believes coal resources to have been overestimated. Reference is made to the present reserve position in various areas and to political aspects of the problem. G. D. H.

1258. Papers at the Fourth World Petroleum Congress. Anon. *Petrol. Times*, 29.4.55, **59** (1506), 433.—Summaries are presented of papers to be given at the Congress. Section I—Geology and Physics, Section II—Drilling and Production, Section III—Oil Processing, Section IV—Production of Chemicals from Petroleum, Properties and Applications, Section V—Composition of Petroleum Analysis and Testing, Measurement and Control, Section VI—Utilization of Petroleum Products, Section VII—Construction of Equipment, Materials Corrosion, Section VIII—Transport, Storage, and Distribution, Section IX—Economics, Statistics, and Education. G. A. C.

1259. International Internal Combustion Engine Congress. Anon. *Petrol. Times*, 29.4.55, **59** (1506), 505.—Summaries are given of the 28 papers submitted by 10 countries at the Fourth World Petroleum Congress for the Internal Combustion Engine Congress to be held at The Hague, 23–26 May 1955. The general theme is with diesel engines in railway use and in marine and stationary employment. G. A. C.

1260. Comparison of foil packages. J. R. Chapman and F. J. Schay. *Mod. Packag.*, April 1955, **28** (8), 220.—9 existing or proposed types of foil packaging are evaluated for degree of protection afforded, cost, and ease of manufacture. G. A. C.

BOOK REVIEWS

Science of Petroleum, Vol. V, Part III: Refinery Products. General Editors: B. T. Brooks and A. E. Dunstan. London: Oxford University Press, 1955. Pp. viii + 397. £6 6*s*.

The original policy of the editors of the first four volumes of "Science of Petroleum," published in 1937, was to issue, from time to time, supplementary volumes in order to keep such a massive production up-to-date. The war of 1939–45 interrupted such intention, but in 1950 Part I of Volume V appeared, followed by Part II in 1953. The present work under review completes Volume V, which is intended to deal with the chemical, physical, refining, and manufacturing aspects of the petroleum industry. By abstracting the literature on such subjects, the authors of the 23 separate papers constituting Part III have indeed succeeded in bringing before the reader the latest developments and advances, with due regard to the inevitable lapse of time caused by the actual mechanics of publication of such a composite work.

The individual authors are all engineers, physicists, or chemists who are specialists in their own particular field and have been prominently associated with major developments since 1939. The subjects cover a wide range from aviation fuels for I.C. and jet engines, diesel fuels, and lubricating oils to speciality products such as microcrystalline waxes and white oils. Separate papers on infra-red, mass, and Raman spectroscopy, X-ray examination, and magneto-optical rotation outline the application of these techniques to special analysis, while a comprehensive survey of the normal methods of analysis and testing is included.

The section on knocking characteristics of hydrocarbons consists in the main of a catalogue of engine test data reproduced in part from published literature, and would appear to be unduly long, occupying one-quarter of the whole publication. The accompanying graphs and interpretation of the data, however, are of undoubted value to the worker in this field. Another large section deals with laboratory and small scale distillation, and includes a complete bibliography of this important physical separation process.

Progress in research and development can only be brought about by applying new ideas and information to the many and varied problems that confront the industry. By the publication, at intervals, of accumulated knowledge and investigational details, the editors of "Science of Petroleum" are giving the petroleum technologist an immense and valuable service. H. C. R.

Geology of Petroleum. A. I. Levorsen. San Francisco: W. H. Freeman, 1954. Pp. x + 703. $8 (68*s*.)

This book can be thoroughly recommended to all those with a knowledge of the basic principles of geology who require a one volume text-book, of reasonable size, on the behaviour of oil in rocks. Professor Levorsen does well to devote a preface and introductory chapter to analysing and defining his subject. It is the "understanding of the geological history of an area—its stratigraphy, its sedimentation, its deformation, and especially its fluid phenomena" which "aids most in the discovery of new oil and gas pools, or in the extension of old ones." As the main object of academic geology is the study of the structure and history of the earth, the oil geologist's special interest lies in fluid phenomena, which themselves, of course, may provide evidence on geological structure and history. Professor Levorsen has deliberately called his book "Geology of Petroleum" and not "Petroleum Geology," because the geological concepts which are applied to the search for and production of oil are all established and recognized principles. He necessarily assumes the reader to have the background knowledge of academic geology the subject requires—a knowledge of the jargon is not enough.

After the two short introductory chapters referred to, including 36 pages on the Occurrence of Petroleum, Professor Levorsen divides his 600 pages into four parts, the first three called the Reservoir (203 pages); the Petroleum

Pool (127 pages); the Geological History of Petroleum (47 pages); the fourth is a sort of philosophic basket, somewhat inappropriately headed Applications (67 pages) dealing thoughtfully with geological items such as dry holes (bless them if drilled by others!), economic factors, personal factors, and geological concepts of special use in oil exploration. There is an index, an appendix of reference matter (14 pages), 810 references, with selected references therefrom for general reading, and numerous diagrammatic illustrations.

25 or so years ago, petroleum geologists were still largely preoccupied with surface structure hunting, with the anticline as the main quarry. It is fair to say that the considerable general advance of knowledge about oil in the earth in the last quarter century, as summarized in Professor Levorsen's book, is due to studies carried out on the material provided by the vast number of deep boreholes drilled during that time, and particularly on those drilled down flank from structural uplifts.

Much of our present knowledge about oil in the rock has come from co-operative work between petroleum engineers, reservoir engineers, and geologists. Levorsen's wide definition of the scope of the petroleum geologist's domain (he regards him as a co-ordinator spanning the gap between geology and many related sciences and applied sciences) will probably not be accepted by everybody, but nobody can doubt the need in oil exploration for good general scientific practitioners with an adequate background of geological knowledge if progress is to be maintained. It is interesting to ponder on the fact that, as far more exploration holes are commercially unsuccessful than otherwise, the "dry holes" have clearly provided a large proportion of our present knowledge. It seems likely that scientific exploration will react to this obvious fact in the future, by giving more attention to the information hole. An information hole, which may be described as a "dry hole" in the right place for obtaining the knowledge required, may clearly be more useful than a number of "dry holes" in the wrong places for that purpose, even if the operator has to pay for the hole himself.

Last year British oil technologists welcomed the very useful little book by Dr. G. D. Hobson of the Imperial College entitled "Some Fundamentals of Petroleum Geology." All technical workers concerned with oil exploration and production, in particular geologists with a normal training in pure or academic geology about to join the oil industry, are now also indebted to Professor Levorsen for this larger but equally admirable addition to their reference libraries, although unfortunately the high price of the book will prohibit many from purchasing a personal copy.

In a book of this scope there will inevitably be a few statements with which individual readers of experience may disagree; this is to be expected in an exact science like oil exploration. Suffice it to say, that the reviewer found extraordinarily few things to quarrel with during his, unfortunately far too brief, perusal. One curious factual error, in view of the many sources of correct information available, is a misprint on Fig. 2-2 (p. 18). The Magwa oilfield of Kuwait is a northern extension of the Burgan field situated immediately north of Burgan, and is *not* north of Kuwait Bay as shown. N. L. F.

Spontaneous Ignition of Liquid Fuels. B. P. Mullins. London: Butterworth's Scientific Publications, 1955. Pp. xi + 117. 20*s*.

This volume is designed as a review and assessment of the state of knowledge in the field of spontaneous ignition of liquid fuels and contains a host of references to the literature. Experimental methods of determining spontaneous ignition and the significance of the results are treated extensively in eight of the 14 chapters in the book, and results are tabulated for 433 substances.

As a reference book to methods and results, the monograph is invaluable. However, the discussion of results is rather limited and does not match the detailed account of experimental procedures. It is true that theory lags behind in the field of combustion research in that prediction of behaviour in any new system is limited. It is for this very reason, however, that the reviewer regrets that a more detailed survey of this aspect of the problems is not included. Many theoretical topics are indeed discussed and fully documented in the course of the chapters on experimental methods, but a collected account of the development and status of this part of combustion theory would, in the opinion of the reviewer, have added even more to the value of this book.

It is inevitable that the survey of a field of such magnitude must lead to a rather brief treatment of certain items. Brevity can lead to rather irritating snippets of information which do not in fact give any picture at all; for example, in mentioning the difficulties encountered in rocket motors by ignition delay causing an ultimate violent ignition and explosion of the fuels, Dr. Mullins states that "Kistiakowsky has patented a method by which these troubles may be avoided in the case of gasoline-fuming nitric acid mixtures in rocket motors." The reader is left to consult the relevant patent specification in order to obtain any details of the method used.

Such objections can nearly always be raised, however, on reading what is in reality a reference book and, adopting a fairer attitude in regarding this volume essentially as such, Dr. Mullins is to be congratulated on providing a very full and useful documentation of the field of spontaneous ignition, coupled with a critical account of the experimental techniques available for measurement of this quantity. M. F. H.

Solvent Properties of Amphiphilic Compounds. P. A. Winsor. London: Butterworth's Scientific Publications, 1954. Pp. ix + 207. 40*s*.

All who are familiar with Winsor's work will welcome this book, which sets it out with much additional material against the background of our knowledge of soap solutions. A short introduction is therefore followed by an excellent chapter on the soap–water system. This is followed by an account of typical solubilization phenomena; this also includes his phase nomenclature. Succeeding chapters deal with effects due to molecular weight, shape, and chemical nature of components. All of these are dealing with liquid components (apart from the pure soaps) but Chapter VII is on solubilization of crystalline solids; this is rather weak. The book ends with a good account of the confused field of X-ray diffraction results.

Winsor interprets his results by his ratio of the mutual interactions, a method which in the reviewer's opinion confuses and has no advantage over the older general idea of philic–phobic balance. It must, however, be admitted that it seems to have helped him to sort out an exceptionally complex mass of observations. The material, however, in Chapters IV, V, and VI is not sorted out in any particularly clear manner, and one wonders how far his success is due primarily to his having carried out a very large number of planned experiments and rigorously recorded what he saw—a method of working which is rapidly becoming extinct among physical chemists. It has resulted in observations upon a very large number of different systems, so that the reader is continually interested but sometimes irritated because one of these systems has not been examined in greater detail. There is a reluctance to use phase rule discipline; for example, when a type III solution suddenly appears and is described as of theoretical importance; and this is also seen in a loose nomenclature such as "liquid crystalline homogeneous G phase or gel," and "micelles or 'cybotactic' complexes." There is no statement anywhere nor illustrations of the evidence upon which Winsor decided that his G phase was liquid crystalline; no mention whether smectic or nematic—a point of the highest importance, since the smectic is, as he draws it, a layer lattice, whereas

the long axes of the molecules in the nematic phase have an imbricated arrangement which precludes layer sliding upon layer. There is mention of streaming birefringence of this phase, but this is not a liquid crystalline structure. The most curious feature of the work is that it is all concerned with systems in which the concentration of the soap is high and so we get no lead through to ordinary emulsification conditions. Nevertheless, the book is one which will be of great interest and value to all who are interested in emulsions as well as to workers on soaps, detergents, and all their related problems both academic and applied.

The book will be of value to many petroleum technologists working in a variety of fields. It is exceptionally well printed. A. S. C. L.

ADDITIONS TO THE LIBRARY

British Standards:

B.S. 489 : 1955. Steam Turbine Oils. Pp. 49. 7*s.* 6*d.* net, post free.

A revision of the standard first published in 1933 and now including oil-containing additives. Four grades of oil are defined by kinematic viscosity ranges at 100° F and min viscosities at 210° F. Other defined properties are inorganic acidity, flash point, pour point, demulsification number, corrosive sulphur, rusting, and oxidation. Methods of test are technically identical with IP methods.

B.S. 2594 : 1955. Horizontal Mild Steel Welded Storage Tanks. Pp. 27. 4*s.* net, post free.

B.S. 2595 : 1955. British Standard Descriptions and Methods of Measuring Sizes and Outputs of Crushing Machinery (when used for producing aggregates for constructional work). Pp. 9. 2*s.* 6*d.* net, post free.

ABSTRACTS

	PAGE
OILFIELD EXPLORATION AND EXPLOITATION	
Geology	137 A
Geophysics and Geochemical Prospecting	139 A
Drilling	139 A
Production	140 A
Oilfield Development	141 A
TRANSPORT AND STORAGE	141 A
REFINERY OPERATIONS	
Refineries and Auxiliary Refinery Plant	141 A
Distillation	142 A
Special Processes	142 A
PRODUCTS	
Chemistry and Physics	142 A
Analysis and Testing	143 A
Gas	144 A
Engine Fuels	144 A
Lubricants	145 A
Bitumen, Asphalt, and Tar	145 A
Special Hydrocarbon Products	146 A
Derived Chemical Products	146 A
Coal, Shale, and Peat	146 A
Miscellaneous Products	146 A
CORROSION	146 A
ENGINES AND AUTOMOTIVE EQUIPMENT	148 A
MISCELLANEOUS	148 A
BOOK REVIEW	148 A

AUTHOR INDEX

The numbers refer to Abstract Numbers

Albert, P., 1293
Alles, M., 1342

Baibakov, N. K., 1301
Barnard, G. P., 1333
Barrett, J. P., 1368
Berger, Y., 1290
Bernelin, B., 1348
Blomerth, E. A., 1283
Borowski, J., 1306
Breitung, C. A., 1300
Bridgeman, O. C., 1329
Buzon, J., 1357

Chajes, W., 1292
Cook, F. E., 1376–7
Corrigan, T. E., 1319
Courtel, R., 1342, 1348
Crawford, P. B., 1294
Crozier, A., 1326
Cumming, A. P. C., 1325

Depowski, S., 1279
DeVerter, P. L., 1382
de Witte, L., 1378
Dinkloh, E., 1358

Fancher, G. H., 1262
Farrar, G. L., 1370
Favre, J., 1337, 1347
Filak, G. A., 1331
Flister, E., 1356
Franck, H-G., 1357

Galloway, P. M., 1324
Gamulczynski, J., 1288
Gardner, F. J., 1263, 1365–6
Gibson, R. P., 1274
Gladel, Y. L., 1326
Gladfelter, R. E., 1299
Glogoczowski, J. J., 1335
Goffredo, L., 1338
Groff, J., 1351
Guillemin, A., 1326
Guyot, R., 1339

Hafsten, R. J., 1369
Hayhurst, L. J., 1360
Henquet, R., 1388
Hirsch, J. N., 1316
Hoffman, H., 1352
Holek, S., 1322
Hoot, C., 1264
Horne, W. A., 1316
Horton, L., 1364
Houpeurt, A., 1298
Hunt, K. C., 1340
Hurst, R. E., 1297
Hussong, R. U., 1360
Hyde, A. P., 1304

Irwin, J. S., 1268

Jasek, A. W., 1382
Jones, L. W., 1368
Jones, W. I., 1387
Jungewelter, N., 1355

Karlic, S., 1286
Kellog, H. W., 1328
Kermarrec, F., 1343
Kisiow, A., 1284
Kmiecik, M., 1289
Konopicky, K., 1320
Kuropieska, J., 1322

Labouysse, M., 1290
Labre, J., 1348
Landrum, B. L., 1294
Luchter, A., 1334
Lyles, H. R., 1312
Lyman, A. L., 1385
Lyons, P. L., 1280

McAfee, J., 1316
McDowall, A. R., 1386
Malone, G. F., 1374
Mason, H. C. K., 1386
Meyer, L. W. A., 1373
Meyer, R. E., 1315
Mills, J. F., 1376–7
Montgomery, C. W., 1316
Moore, J. M., 1297
Morrisey, N. S., 1261, 1263, 1267
Mosurski, H., 1346
Moyal, M., 1277

NACE Task Group T-3E-1, 1375
NACE Technical Committee T-1J, 1367
NACE Technical Unit Committee T-3A, 1366
Natta, G., 1321
Nielson, E. K., 1360
Niementowski, S., 1314
Parker, M. E., 1383
Patzau, S., 1349
Pawlikowski, S., 1380
Pfeiffer, C., 1318
Preiser, H. S., 1376–7

Quarleri, L., 1323

Radd, F. J., 1378
Ramsey, D. E., 1297
Raschig, K., 1354
Resen, F. C., 1303
Rossi, C., 1323

Samans, W., 1311
Sandler, H. J., 1316
Sandlin, H. L., 1331
Schmitt, A., 1358
Schoeller, H., 1281–2
Schwalm, L., 1372
Scogin, R. J., 1373
Seymour, R. B., 1313
Sharpe, L. G., 1381
Solik, J., 1302
Stankiewicz, E. J., 1309
Stockholm, C. J., 1331
Strzetelski, J., 1291
Summers, C. R., Jr., 1316
Swaminathan, V. S., 1361
Symonds, G. H., 1307
Szostak, L., 1285
Szymanski, J., 1291

Temme, T., 1353
Terres, E., 1359
Thornton, D. P., Jr., 1305
Todhunter, H. A., 1371
Torrey, P. D., 1295
Tracey, G. W., 1299
Traustel, S., 1336

Vacuum Oil Co., 1350

Walper, J. L., 1261
Walson, K. A., 1365
Waterman, H. J., 1327
Watkins, J. W., 1296
Watson, H. J., 1345
Watts, J. C., 1379
Weber, G., 1308
Wheeler, R. N., 1365
Wilsey, L. E., 1299
Wojnar, J., 1287

Zimmeschied, W. J., 1330

OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

1261. Tight folds should harbour more than one oil trap. N. S. Morrisey and J. L. Walper. *Oil Gas J.*, 16.5.55, **54** (2), 192.—Theoretical fault patterns developed by simple horizontal compression under ideal conditions show that several fault blocks can develop on a fold, and oil may occur in any or all of these blocks. By studying lab models and known oilfields it may be possible to predict oil traps in structures which have suffered compression. Examples from Turner Valley, Ventura Avenue, and elsewhere are discussed, and cross-sections of the fields are included. C. A. F.

1262. Report on Texas' oil resources. G. H. Fancher *et al.* *Oil Gas J.*, 21.2.55, **53** (42), 115.—The bulk of the oil produced in Texas has come from Cretaceous beds, the most prolific being the Woodbine sand. The second largest producer is the Permian, followed by the Oligocene, Eocene, Pennsylvanian, Mio-Pliocene, and Ordovician.

Reserves and productivity of these formations are outlined. C. A. F.

1263. Texas' oil future assured by new horizons in exploration. N. S. Morrisey and F. J. Gardner. *Oil Gas J.*, 13.6.55, **54** (6), 153.—The results of recent exploration in Texas are described, and it is emphasized that there are still large areas of virgin and semi-virgin territory. There may be as much undiscovered oil offshore in the tidelands as has been found to date onshore along the coast; 6 offshore fields are now producing.

In S. Texas all types of oil trap occur, but current interest is centred on fault traps along the Mexia–Talco fault zone. Navarro and Austin pays have been found in small closures against *en echelon* faults.

In the Gulf Coast area activity is concentrated on locating deeper pays, new flank sands, and new fault blocks on older producing structures; some new fields have also been found.

In E. Texas there has been renewed activity, and new fields have been discovered.

In W. Texas and N. Texas there has been widespread exploration for pays in the Permian and pre-Permian with an intensive search for pre-Permian production in the Texas Panhandle. C. A. F.

1264. Permian basin rewards rechecking efforts with dozen big discoveries. C. Hoot. *Oil Gas J.*, 23.5.55, **54** (3), 135.—Exploration in the W. Texas basin is concentrated on deep

drilling to develop pre-Permian zones which underlie old producing fields; 12 large fields, all of which lie along the trend of the Central basin platform fields, have been found so far this year. Main objectives are Ellenburger, Devonian, and Strawn. 9 of these pre-Permian discoveries are listed and briefly described, and their locations are shown on a map.
C. A. F.

1265. Texas oil flows from rocks of every geological age. F. J. Gardner. *Oil Gas J.*, 21.2.55, **53** (42), 107.—Oil has been produced in Texas from beds of every period from Cambrian through Quaternary since the first field was found at Oil Spring in Nacogdoches County in 1876. The early fields produced oil from Tertiary sands at depths less than 100 ft, and the most recent fields are producing from Cambrian and Ordovician down to 15,000 ft.

The productive rocks of Texas are described in order of age; *ca* 95% of the oil is produced from post-Cryptonic sediments, and *ca* 12 fields produce from altered igneous rocks. Other pays are conglomeratic granite wash, and partly metamorphosed anhydrite and cap rock on salt dome structures.
C. A. F.

1266. New approaches may find Florida's oil. F. J. Gardner. *Oil Gas J.*, 16.5.55, **54** (2), 295.—Only 2 small fields have been found in Florida, and exploration has been generally unsuccessful. The most favourable area for accumulations is between the swampy Everglades area and the Ocala uplift in the N. part of the peninsula; fields may be found in the wedge out area of Lower Cretaceous, where the Upper Cretaceous overlaps the Lower Cretaceous towards the Ocala uplift.

Current interest is centred in offshore areas, where 2 deep wells are to be drilled nr Miami to test the Sunniland (Glen Rose) limestone.
C. A. F.

1267. Why South Louisiana lures heavy play. N. S. Morrisey. *Oil Gas J.*, 16.5.55, **54** (2), 296.—Exploration in S. Louisiana has been expanding, and there has been a marked increase in seismic activity during the last 2 years. Development is concentrated on prolific Miocene sands, where reserves of 50,000 brl/acre are common, with highly porous and permeable sands and pay zones ranging from less than 10 ft to over 800 ft.

Oligocene Frio sands are also prolific producers, but E. of Baton Range calcareous development reduces the production potential.

N. of the Frio trend there is some Wilcox production from many fields which produce from erratic sands on small structures.

The regional geology of the area is outlined, and although salt domes and fault traps are currently the main prospects, it is indicated that stratigraphical traps will be an important future source of oil.
C. A. F.

1268. Canada's mountains : a new oil frontier. J. S. Irwin. *Oil Gas J.*, 6.6.55, **54** (5), 172.—The discovery of gas on the Savanna Creek structure in the mountain area 60 miles SW of Calgary, Alberta, has aroused interest in the potentialities of this area, which is within the complex mountain zone of the Rockies.

The area has been explored since 1939, and gas has been found in Mississippian Rundle in porous zones ranging from 7210 to 8150 ft. These have yielded over 50 M.M.c.f.d. of gas.
C. A. F.

1269. Drilling record set. Anon. *Oil Gas J.*, 21.2.55, **53** (42), 102.—A well has been drilled in the Rub al Khali desert of SE. Saudi Arabia, following geophysical work and core drilling; no oil has been reported, and the well is at 12,789 ft in Mesozoic.

A deep well has also been drilled in the offshore Safaniya field in the Persian Gulf near the Neutral Zone border. 16 wells, all but 2 drilled offshore, have been completed in the field, which can produce 27° oil from Cretaceous sand at *ca* 5600 ft. Production will start when distribution facilities, including a pipeline to Ras Tanura, have been completed.
C. A. F.

1270. Kuwait test hits. Anon. *Oil Gas J.*, 16.5.55, **54** (2), 139.—1 Raudhatain, *ca* 27 miles S. of the Iraq border in N. Kuwait, has reported commercial oil production on test of Burgan sands which are said to be thick. The well is being deepened to test for lighter oil in the underlying Zubair beds, which are productive in Iraq.
C. A. F.

1271. 1150 brl discovery gives Egypt a new oilfield. Anon. *Oil Gas J.*, 14.2.55, **53** (41), 92.—1 Belayim, in the S. part of the Sinai peninsula, has discovered a new field in the oil-bearing region of Egypt; on test the well flowed at 48 brl/hr from *ca* 7350 ft in Miocene. 2 other oil sands were reported at *ca* 5000 and 7000 ft.

This is the first field to be found in Egypt since 1948, and the seismic map indicates it may be the largest structure in the Gulf of Suez area.
C. A. F.

1272. Sinai output rising. Anon. *Oil Gas J.*, 23.5.55, **54** (3), 99.—A new pay zone has been discovered in 3 Belayim on the Sinai peninsula at *ca* 7000 ft with an indicated potential of *ca* 1000 b.d. The Belayim field is reported to have conditions similar to the Ras Gharib field on the W. shore of the Gulf of Suez, where 7 pays have been developed.

4 wells have been completed in the Feiran field.
C. A. F.

1273. Nigerian test deep. Anon. *Oil Gas J.*, 16.5.55, **54** (2), 139.—1 Zzam has been drilled to below 12,000 ft without finding commercial oil, but oil and gas shows had previously been found in 2 wells at Akata and Ituk Mbang in Calabar province.

Exploration in the area started in 1937, but was suspended in 1940 and not resumed until 1946. Since then geophysical and geological work have been carried out over a wide area.
C. A. F.

1274. Gas found in Pakistan. R. P. Gibson. *Oil Gas J.*, 13.6.55, **54** (6), 145.—Sylhet 1, a wildcat on an anticline at Haripur in E. Pakistan, found gas at 7800 ft following a seismic survey of the area. The well is *ca* 40 miles W. of the abandoned Badarpur field.

In Assam, Digboi is producing *ca* 5400 b.d. from Miocene sand, and small amounts are being produced from Nahorkatiya, 20 miles to the SW.

In W. Pakistan gas shows have been found in the Uch area at 6000 ft, and in the Sui area 6 gas producers have been completed.
C. A. F.

1275. Australia hits oil. Anon. *Oil Gas J.*, 6.6.55, **54** (5), 90.—A well drilled 50 ft from the Rough Range discovery in W. Australia on test flowed at 60 brl/hr from a zone at *ca* 3603 ft. The well was deepened to 14,000 ft, encountering indefinite shows below 9000 ft.
C. A. F.

1276. Major Italian find looms. Anon. *Oil Gas J.*, 14.2.55, **53** (41), 92.—A test of a well at Pescara on the Adriatic coast of the Italian mainland gave 2000 b.d. of 34° oil from 2550 ft. This is more than the total crude oil output for the country, although large quantities of gas are produced from the Po Valley fields.

Heavy oil is being produced from the Ragusa field in Sicily, discovered in 1953.
C. A. F.

1277. Recent strikes stir oil-finding hopes. M. Moyal. *Oil Gas J.*, 6.6.55, **54** (5), 109.—Oil reserves in Italy have been increased substantially following the discovery of the Ragusa and Alanno fields. There are 3 prospective oil-bearing areas in the country: Sicily, the Adriatic seaboard in S.-Central Italy, and the valley of the Po River in N. Italy.

Oil shows have been known in Sicily since Roman times, but commercial oil was not found until 1953, when the Ragusa field was proved in SE. Sicily. Pay is Mesozoic at *ca* 6000 ft and oil gravity is 19·2°. Several wells have been drilled, and a 650 ft-thick pay section has been found. Some gas production has also been found in Sicily.

The new field at Alanno, nr Pescara, may prove to be one of the most prolific fields in Europe; 1 Cigno, the discovery,

has produced up to 3700 b.d. Gross pay thickness is *ca* 300 ft and the oil is light. C. A. F.

1278. Sicilian field expands. Anon. *Oil Gas J.*, 23.5.55, **54** (3), 98.—4 producing wells have been completed in the Ragusa field in SE. Sicily; field production is *ca* 450 tons/day or *ca* 3000 b.d. of 20° oil. 15 additional wells are planned by the end of 1956 to bring output up to *ca* 18,000 b.d.

A field has been found at Alanno, nr Pescara, on the Italian mainland, but development awaits an exploitation concession from the Italian Government. C. A. F.

1279. Science and technique in Soviet Union—the organization of geological service of the Soviet petroleum industry. S. Depowski. *Nafta (Krakow)*, 1954, **10** (6), 141–2.—Described with a diagram. M. S.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

1280. What's ahead for geophysics? P. L. Lyons. *Oil Gas J.*, 23.5.55, **54** (3), 170.—Total cost of world-wide geophysical exploration in 1954 was *ca* $325 million, but there has been a world decline in seismic prospecting from a peak of 1040 seismic parties in 1952 to 840 in 1954.

In the past world reserves have closely followed the increasing use of geophysics, and it is suggested that this decline will be reflected in the next few years by a decline in the rate of increase of reserves or by a slight decline in total reserves.

The historical background to geophysical exploration in the U.S.A. is outlined, and the need for new techniques and interpretation is emphasized. C. A. F.

1281. Geochemistry of subterranean waters: application to oil-bearing beds. I. General chemistry of subterranean waters. H. Schoeller. *Rev. Inst. franç. Pétrole*, 1955, **10** (3), 181–213.—Data on the solubility of a range of simple gases are given, showing the effect of temp and of the presence of dissolved NaCl. The solubility of salts is discussed, reference being made to dissociation constants, activity coeff, and ionic forces. Tables present data on the solubilities of a range of simple inorganic compounds, showing the influence of temp, and, in the case of NaCl, of pressure, as well as the solubility of gypsum in the presence of NaCl. Various solubility products are listed. Hydration, hydrolysis, oxidn and reduction, and the attack of minerals by acids are briefly described, while calcium carbonate, dolomite, silicates, and the behaviour of iron receive fuller consideration. G. D. H.

1282. Geochemistry of subterranean waters: application to oil-bearing beds. II. Presentation of water analyses. H. Schoeller. *Rev. Inst. franç. Pétrole*, 1955, **10** (4), 219–46.—The various methods of presenting the results of water analyses are given, reference being made to both numerical and graphical methods, and preference being expressed for a logarithmic scale with the elements or radicals equally spaced. The modification of waters is discussed, and the interaction of hydrocarbons and sulphates without bacterial aid is indicated to require temp well above normal. The phenomenon of base exchange is described, as well as the effects of certain components with regard to increasing the solvent power of the water. Temp, pressure, area, and time of contact will all affect the concn which may be attained.

The nature of the water will be linked with the type of rock in which it occurs, but the rock type is not the sole determinant, and climate and feed have their effects. G. D. H.

1283. Using refraction work in South Florida. E. A. Blomerth. *Oil Gas J.*, 14.2.55, **53** (41), 180.—Reflection mapping has been found unsuccessful for exploration in the S. Florida embayment, where there are thick sections of carbonates and evaporites, and refraction work is now being carried out. The method is costly, and its success depends on the method of interpretation chosen. Optimum recording frequencies are very low, but the general character of an event at a given distance is fairly consistent over a large area.

Attempts have been made to map a shallow and a deep horizon, using a minimum grid of 3 miles where possible. Ties between intersecting profiles are very good, with an accuracy of $\pm 0{\cdot}002$ sec where records are fair to good. C. A. F.

1284. Seismic cross-section of western part of Potok anticline. A. Kislow. *Nafta (Krakow)*, 1954, **10** (6), 126–9.—Work on this subject was begun before 1939 and completed in 1952. The line of shots, which were 14–25 inches deep (average), 600–1100 m apart, runs WSW. to the axis of the geological formations investigated. Later work was done with Soviet equipment. The structure of the area is well known, and this work was aimed at elimination of grosser errors. A map and a profile are given. M. S.

DRILLING

1285. Rotary drilling technology in the light of the U.S.S.R. experience. L. Szostak. *Nafta (Krakow)*, 1954, **10** (5), 105–9.—Rotary progress depends on P, axial pressure on drill, n, revs per minute, and q, rate of mud flow in l/minute, as well as qualities of drill, mud, and rock. Each relationship can be represented by a graph sloping steeply at first and later flattening out or even reversing its slope. Bearing in mind the wear of the bit, the most economical values are at the point where these curves flatten out. Furthermore, as P and n are increased it becomes necessary to raise q in order to keep the bit free and cool. The Polish IP is working to adapt these observations to the conditions and equipment available in Poland. M. S.

1286. JL.35-Rudno (rotary) drilling unit for 1500 m. S. Karlic. *Nafta (Krakow)*, 1954, **10** (6), 132–8.—As a result of competition for a hoist one known as JL31-Rudno was accepted, subject to improvements, in 1949. Whilst the prototype was being built the same team produced under the name JL5-Rudno a rotary drilling unit. The 2, after adjustments, have been offered together and are here fully described. M. S.

1287. Rock bits and their regeneration. J. Wojnar. *Nafta (Krakow)*, 1954, **10** (5), 101–5.—To increase the efficiency of drilling the string must remain underground as long as possible at a stretch. This can be achieved using good quality bits and by crews taking good care of them. Several steels used in the U.S.S.R. are listed and their composition given. In Poland rotary drilling in 1953 contributed 65·2% of the total, 70% of the exploratory and 79% of productive drilling being done by rock bits. Detailed instructions on how to take a worn bit to pieces and reassemble it are given. Such work is done in the State Establishment Rock Bit Factory, which opened in 1952. M. S.

1288. Lime-base drilling muds. J. Gamulczynski. *Nafta (Krakow)*, 1954, **10** (6), 129–31.—Lime-base muds are resistant to a high proportion of electrolytes and suitable for drilling through calcium salts. The Polish IP has been experimenting with the composition of such a mud. In one case the ratio of added ingredients was 53 pts by wt NaOH, 21 quebracho, 60 $Ca(OH)_2$, and 100 potato starch/7000 litres of existing mud, but in general a fair degree of variation is permitted. In the case described visc has not changed, filtration and sedimentation have fallen, and so has the structural strength of the mud. Resistance to electrolytes rose considerably. Method of mixing is given. M. S.

1289. Apparatus for continuous recording of methane contents in drilling mud. M. Kmiecik. *Bull. Polish Inst. Petrol.*, 1954, **4**, 5–6 (suppl. to *Nafta (Krakow)*, 1954, **10**).—CO_2 analyser has been adapted for this job and used on one exploratory borehole. This acts on the principle of different thermal conductivity of air and methane. Gas from the mud is mixed

with air and led to the apparatus. Analysis of this kind can be very useful. M. S.

1290. Gel-cement and bentonite–oil. Y. Berger and M. Labouysse. *Bull. Ass. franç. Tech. Pétrole*, March 1955, (110), 149–71.—Drilling in the Aquitaine concession is rare without partial or total loss of circulation.

Gel-cement consists of water, cement, and bentonite, with or without plugging agents, and has a high visc. Equipment for mixing and handling such cement is described, and several usable mixtures are given, together with data on pumpability.

In one case 6 lots of gel-cement were used before circulation was re-established. In 1953 26 applications succeeded in sealing 9 out of 10 zones of loss sufficiently to enable operations to continue. The failure related to a cavern of 2·6 m. A summary of this work is given.

Bentonite does not swell in oil, and mixtures with as much as 125% by wt of bentonite can be pumped. Such a mixture reaching a water-charged zone can give a gel which may block zones of lost circulation. To prevent the gel being formed in the drill pipe the mixture is preceded and followed by slugs of oil. Equipment for mixing and emplacing the bentonite–oil mixture is described, and the characteristics of various mixtures are listed.

The salient points of some operations using bentonite–oil mixtures are given, and in 1953 4 such operations were performed, 2 being successful.

Gel-cement sealing is a longer operation, but gives a harder seal. Bentonite–oil may be preferable in a producing formation. For large fissures bentonite–oil can be followed by gel-cement. G. D. H.

1291. Logging of oil wells with the aid of gamma rays. J. Strzetelski and J. Szymanski. *Papers Polish Inst. Petrol.*, 1954, **34**, 3–8.—The Polish IP and the Academy of Mines and Metallurgy (Krakow) have collaborated to improve the equipment. After completing some field work it has been established that γ-logging cannot by itself be sufficient to identify geological strata. Complementary to it are neutron and electrical conductivity logging. M. S.

1292. Chemical character of waters of the lower chalk. W. Chajec. *Bull. Polish Inst. Petrol.*, 1954, **4**, 5 (suppl. to *Nafta (Krakow)*, 1954, **10**).—Polish IP (section "brines") has compiled notes on subterranean waters from newly drilled holes. Compared with data from 1933 for one of the older boreholes, little change was observed. A table giving the composition of 2 strata is included. M. S.

PRODUCTION

1293. Measurement of fissure and macro-pore porosities. P. Albert. *Rev. Inst. franç. Pétrole*, 1955, **10** (3), 155–64.—In a fissured rock it is necessary to know the degree of fissuring and also the characteristics of the micro-porous rock in which the fissures occur. The reserves depend on the storage capacity and the means by which the oil can pass to the wells. For fissured rocks a specimen of small dimensions may not give an adequate measure of the rock porosity, although the same volume could be quite representative for micro-porosity. Water advance through homogeneous micro-porous media will generally be even. In fissured rocks 2 general oil–water contacts exist, one in the pores, the other in the fissures, and water advance will differ in the 2 environments, and micro-pore oil may be by-passed and so become irrecoverable. Thus the oil in the fissures may constitute the bulk of the recoverable oil, and so in porosity measurements micro- and macro-porosity must be distinguished. A macro-pore can be defined as a space of little or no capillarity, and in principle, using mercury and rarefied air, the micro- and macro-porosity can be obtained by a capillary pressure technique. Other methods have been described.

The capillary pressure equipment is described, and samples 9 cm long and 9 cm dia can be used. The mode of use is indicated.

Investigations suggest that 5% fissure porosity is probably the max in practice, and the mean value for a series of different beds was *ca* 2%. G. D. H.

1294. Effect of unsymmetrical vertical fractures on production capacity. P. B. Crawford and B. L. Landrum. *J. Petrol. Tech.*, 1955, **7** (4), 47–50.—An electrical model has been used to study the effect of unsymmetrical vertical fractures on the productive capacity of a well. The ratio of the short and long fractures ranged 0·1–1·0, while the angles between changed in direction from 0° to 180° in 30° steps. The resistance to flow in the fracture is considered to be negligible compared with that in the matrix, but few reservoirs will conform to this. The fractures were most effective when 180° apart. If the total fracture length was 0·2 of the drainage radius, the increase in productive capacity was 1·55–1·95, depending on the angle and on the length ratio, while for a total fracture length of 0·5 of the drainage radius the comparable figures were 1·95–2·65.

It should be noted that in practice fracturing may change the effective drainage radius.

Plots show the results of varying the different factors. G. D. H.

1295. Preparation of water for injection into oil reservoirs. P. D. Torrey. *J. Petrol. Tech.*, 1955, **7** (4), 9–16.—There are many aspects of the problem of preparing water for injection into an oil reservoir. The discussion deals with the materials employed, interfacial tension reduction, removal of suspended matter, prevention of the formation of insoluble compounds, control of the growth of micro-organisms, protection of equipment from corrosion, improvement of reservoir permeability to water, and the control of swelling clays in reservoir rocks. G. D. H.

1296. Design and operation of plants for the preparation of water for injection into oil reservoirs. J. W. Watkins. *J. Petrol. Tech.*, 1955, **7** (4), 17–23.—The success of water-flooding and pressure maintenance operations depends on the design and operation of the water-treating plant, and the latter should be planned for the water available, with the recognition that as the scheme progresses water may have to be recycled. Design involves consideration of the type of water available, acceptable characteristics for injection, primary and ultimate plant capacity, plant site, and cost. Operation is as important as design, and good personnel are needed for efficient operation. Adequate analytical control is needed.

The main points in plant design are described, with notes on alternative treating methods. G. D. H.

1297. Development and application of "frac" treatments in the Permian basin. R. E. Hurst, J. M. Moore, and D. E. Ramsey. *J. Petrol Tech.*, 1955, **7** (4), AIMME Tech. Paper No. 4032, 58–65.—Fracture treatment has been successfully applied to all producing formations in the Permian basin area during the past 5 years, and examples of the results are given. Hydrocarbon and aq gels, emulsions, refined or lease oils, have been used to carry the sand which is often 20–40 mesh, with a high degree of roundness. The fluid depends on formation conditions, while the current trend is to larger gallonage treatments and higher injection rates. Down-the-casing treatments have reduced surface working pressures. High rates and large volumes are evidently beneficial, while combination treatments may be needed for good results in some cases. The max usable sand concn is required, and when properly designed frac treatments can be used for water input wells in secondary recovery operations. It is suggested that the treating material follows naturally-occurring fractures and planes of weakness, so that the resultant drainage pattern depends on the original fracture pattern of the formation. G. D. H.

1298. Elements of the mechanics of fluids in porous media. A. Houpeurt. *Rev. Inst. franç. Pétrole*, 1955, **10** (4), 247–57.—

A series of articles has been planned in which it is intended to present in the simplest feasible manner the elements of the mechanics of fluids in porous media. No originality of material is claimed, and it is intended to group material according to mathematical similarity, even though the problems may be quite distinct in practice.

The equation of continuity, the principle of the proportionality of forces and accelerations, the equation of state of a fluid, and the application of the equations of Navier and Poisson are discussed. The relationships covering flow through a fissure and linear flow through a porous medium are derived, and in the latter case comparison is made with Darcy's equation. A series of fundamental equations are set out.

G. D. H.

1299. Selecting wells which will respond to production-stimulation treatment. R. E. Gladfelter, G. W. Tracey, and L. E. Wilsey. *Oil Gas J.*, 23.5.55, **54** (3), 126.—The development of hydraulic fracturing to stimulate productivity has resulted in the completion of many otherwise non-commercially productive wells. For successful treatment 2 conditions must be studied: (1) the reasons for unsatisfactory productivity, and (2) the design and performance of the required treatment.

Reasons for unsatisfactory productivity are discussed, and a simple method of analysing producing rate and pressure build-up data is presented which permits direct measurement of its cause. The data used can be collected during the first few hr after shut-in.

Sample calculations for a typical well are included. 7 refs.

C. A. F.

OILFIELD DEVELOPMENT

1300. Texas' gas reserves 100 trillion cubic feet. C. A. Breitung. *Oil Gas J.*, 13.6.55, **54** (6), 198.—Proved recoverable gas reserves in Texas in Jan. 1955 were 105,129,062 million cu. ft. at 14·65 p.s.i.a. and 60° F, compared with 75,095,800 million cu. ft. in Jan. 1946.

Gas has been discovered mainly during the search for oil, and 36,579,410 million cu. ft. of present reserves (34·7%) are associated with oil.

Under probable future market conditions the reserves represent *ca* 20–30 years supply. C. A. F.

1301. Towards new increase in petroleum industry in U.S.S.R. N. K. Baibakov. *Nafta (Krakow)*, 1954, **10** (5), 120–1.—New deposits were discovered between Volga and Ural. Central Asian and other territories were disappointing, and discovery of oil in Siberia is desirable. Over half of all drilling was done with a turbine drill. Bit KTD 3 recovers 70% of the core. Progress reached nearly 6000 m/rig/month. Instead of drilling mud, pure water was used in drilling 600,000 m in homogeneous rock. For forced drilling as now practised (3·5–5 m/hr) a better drill must be evolved. Research is also directed at speedier erection and assembly of rigs. Production is being maintained by flooding and hydraulic crushing of rocks. New refineries are directed towards production of diesel and jet fuels. High grade lubricants and elimination of refining losses are on the list of future problems. Natural gas is being supplied more and more for domestic use. Small inventors brought forward 35,000 ideas in 9 months. Plan for 1953 was 100% completed. M. S.

TRANSPORT AND STORAGE

1302. Standards of storage losses of petroleum products. J. Solik. *Nafta (Krakow)*, 1954, **10** (6), 138–49.—Losses are caused by evaporation and drips, as well as by handling. The theory of these is given on the basis of works of Pilat, Chernikin, Nelson, Bell, and others. Included is a table of losses worked out by a team working for the Ministry of Mines. M. S.

1303. Transco internally coats 36-inch pipe. F. C. Resen. *Oil Gas J.*, 20.6.55, **54** (7), 111.—Transcontinental Gas Pipe Line Corpn are spraying internally *ca* 200 miles of 36-inch pipe and 80 miles of 30-inch pipe with an epoxy-based resin at the mill sites. A description is given of the coating method, and of the composition and properties of the coating material.

G. A. C.

1304. How multiplexed telemetering helps a gas pipeline system. A. P. Hyde. *Oil Gas J.*, 6.6.55, **54** (5), 151.—The installation of a Bristol impulse-duration type telemetering system for gas pipelines belonging to the Piedmont Natural Gas Co has permitted almost 99% full load continuous operation. 46 transmitters were installed along the entire 250 miles of the pipeline system. G. A. C.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

1305. Why shut down for expansion? D. P. Thornton, Jr. *Petrol. Process.*, 1955, **10** (5), 658–63.—Careful, detailed planning was both the keyword and watchword in Continental Oil Co's major expansions and revamp of its Lake Charles, Louisiana, U.S.A., refinery which nearly quadrupled the throughput at a cost of $29 million. The problem was not only to add *ca* 33,000 b.d. of crude processing capacity and revamp existing facilities, but also to cause minimum upset to routine process operations; so much so, that in the 18-month construction the whole plant was entirely shut down for only 4 hr. J. G. H.

1306. Power allocation in the refining industry. J. Borowski. *Nafta (Krakow)*, 1954, **10** (5), 117–20.—Refining processes require heat and mechanical power. Since a kilogram of fuel oil has a calorific value of 10^4 Kcal, this has been chosen as a unit. Polish industry uses coal, natural gas, and electricity. During 1951 consumption of power per ton of crude in 5 refineries was 480×10^4 Kcal for direct heating, 750×10^4 Kcal for raising steam, and 182·4 kWh for mechanical power. Over the whole of the Polish petroleum industry the averages were 90×10^4 Kcal, 140×10^4 Kcal, and 33·6 kWh. These figures depend on final products and ancillary equipment. One refinery still used batch dist in 1952. Low power per ton means large throughput and low degree of refining. The ratio of coal to natural gas varies from 1 : 3·5 to 14 : 1. Coal, steam, and gas each have their most suitable application in a refinery. Both coal and gas are used simultaneously in a pipe still of one refinery. All refineries could contribute to the electrical grid more than they actually consume by utilizing low pressure steam. More economical working is most desirable, and this can be achieved by appointing power engineers in charge. M. S.

1307. How to use linear programming. G. H. Symonds. *Petrol. Process.*, 1955, **10** (5), 674–80.—Linear programming is one of the mathematical tools refiners and petrochemical plant operators may find useful in the relatively new science of "operations research"—the practice of making executive decisions based on quantitative information and analysis. 2 applications—blending fuel oil and setting up a running plan—are described by illustrative examples. J. H.

1308. Modern combination processing at new Canadian Petrofina refinery. G. Weber. *Oil Gas J.*, 6.6.55, **55** (5), 113.—The 20,000-b.d. refinery now being built by Canadian Petrofina Ltd at Montreal will incorporate 5 cat processes to yield high

quality light and middle dist and a gasoline octane potential equal to that of any existing refinery. G. A. C.

1309. How to estimate stack costs. E. J. Stankiewicz. *Chem. Engng*, 1955, **62** (6), 239.—A series of graphs, with complete explanations for their use in determining material requirements for steel, brick, and concrete stacks, is presented. Current cost data are also given. Despite variations on individual installations, which make accurate costing difficult, comparative figures are easily obtained. D. J. S.

1310. Here's how Uniflux trays are performing. Anon. *Oil Gas J.*, 20.6.55, **54** (7), 100.—There are over 100 fractionating towers employing Uniflux trays for a large variety of fractionation requirements. Tray construction and operation performance and cost are given, and tables show tray description, operating conditions, and calculated results for various types of operation. G. A. C.

1311. Keep those pressure vessels safe—Pt 2. W. Samans. *Petrol. Process.*, 1955, **10** (5), 666–8.—Pt 2, dealing with the inspection of unfired pressure vessels, specifies the importance of background information such as design limitations, pressure and pressure cycles, temp and temp cycles, and corrosive conditions. Vessel inspection should include visual inspections for corrosion, erosion, cracks in walls or welds, distortion, or local bulging; X-ray or γ-ray inspection for serious internal cracks or flaws, and magnetic particle inspection for surface cracks invisible to the naked eye. Other methods include penetrant methods with either wet or dry application, hammering the walls of the vessel, and sometimes partially destructive sampling. J. H.

1312. New stripper design for better gasoline treating. H. R. Lyles. *Petrol. Process.*, 1955, **10** (5), 655–7.—Cities Service Refining Corpn's Lake Charles, Louisiana, U.S.A., refinery has in substituting a bubble-tray tower of special design for a conventional Raschig ring-packed caustic stripper in a Unisol unit for treating gasoline, improved unit operation, obtained a sweeter product, and sharply reduced chemical costs. It is also expected to greatly reduce maintenance costs, which are now $20,000 annually. J. H.

1313. Optimistic outlook for plastic valves. R. B. Seymour. *Chem. Engng*, 1955, **62** (6), 280.—Plastic valves and valve components are described. Physical and chemical properties are shown in a table, and the main types of plastic are described briefly. The future uses of plastic valves are discussed. D. J. S.

DISTILLATION

1314. Isolation of aromatic hydrocarbons by extractive distillation. S. Niementowski. *Papers Polish Inst. Petrol.*, 1954, **33**, 3–12.—The object of this work was to separate toluene from petroleum fraction boiling at 105°–111° C. Author deals with the theoretical question of extractive dist, proving that the separating agent must raise the relative volatility of the more volatile component whilst not forming an azeotrope with the less volatile component. Furfurol, phenol, and cresol raise most effectively the volatility of paraffins whilst affecting aromatics only slightly. The pilot equipment consisted of 2 columns heated electrically and filled with Raschig rings. Mixture to be separated consisted of the petroleum fraction 105°–111° C and toluene. Separating agent was fed just below reflux return line. Volumes of separating agent and mixture were equal, *i.e.* concn of the former was 56–59 mol %. The compositions of the mixtures fed were approx 50%, 70%, and 80% aromatic. The separating agent to dist ratio varied from 6 : 1 to 9 : 1. Purity of products was estimated using Abbé's refractometer. All results are given graphically—the most effective separating agent is furfurol, which gives a 99·8% toluene from 80% toluene and 98·0% $C_6H_5CH_3$ from 70% $C_6H_5CH_3$; phenol is nearly as good. Traces of separator were removed with H_2O and/or OH. Losses were between 5 and 10%, mostly during handling outside the columns. There were as a rule 2 distinctive fractions coming overhead, the second of which was higher in toluene. If the first one was returned into the lower column the quantity and quality of the second improved.

Some experiments were carried out on a lab batch scale column known as Weber's. Kettle was filled with mixture and separating agent in equal proportions and further quantities of the latter were added just below the reflux. Here, too, furfural proved best.

Another experiment to establish the value of "coeff of improvement" was carried out using pure *iso*-octane and toluene, with and without a separator. This also showed furfural and phenol to be better than cresol. Values obtained were 2·02, 1·95, and 1·62, respectively. On the strength of these experiments a large scale column of 24 theoretical plates were designed for use with phenol. M. S.

SPECIAL PROCESSES

1315. LPG to chemicals—by oxidation. R. E. Meyer. *Oil Gas J.*, 20.6.55, **54** (7), 82.—This is the first of a series of articles on oxygenated chemicals and reviews the origin of the production of chemicals from natural gas, propane, and butane, and gives uses of the products. The Walker, McCarthy, Bludworth, and Meyer processes are described. G. A. C.

1316. Gulf hydrodesulphurization process upgrades crudes. J. McAfee, C. W. Montgomery, J. N. Hirsch, W. A. Horne, and C. R. Summers, Jr. *Petrol. Refin.*, 1955, **34** (5), 156.—A report is presented on lab and pilot plant work on a process to convert residual fractions to lower boiling dist products at moderate pressures. The process also removes sulphur from all fractions of the charge stock. R. L. R.

1317. Will we mine oil? Anon. *Chem. Engng*, 1955, **62** (6), 130.—A new process for obtaining oil from oil sands in Alberta is described. Cost estimates are given that are claimed to show that the process is economically possible. A brief description of a portable separator is given, and coking and sulphur recovery plant is discussed. The sand, being 97·2% silica, may be of use in the glass industry. D. J. S.

1318. Ammonia from cat reformer off-gas. C. Pfeiffer and H. J. Sandler. *Petrol. Refin.*, 1955, **34** (5), 145.—The off-gas from cat reforming contains between 77 and 95% of hydrogen, which can be used in ammonia synthesis. A comparison is made of 6 ammonia synthesis processes. Flow diagrams are given, and the production costs and operating characteristics are compared. R. L. R.

PRODUCTS

CHEMISTRY AND PHYSICS

1319. Chemical engineering fundamentals: interpretation of kinetic data—III. T. E. Corrigan. *Chem. Engng*, 1955, **62** (6), 253.—The principle of the fluidized bed reactor, and a rate equation for a reversible reaction in it is discussed. 2 problems on the interpretation of experimental kinetic data are solved, the second by 3 methods, all graphical. The solutions are shown to be essentially the same. D. J. S.

1320. Technical problems about V_2O_5. K. Konopicky. *BrennstChemie*, 1955, **36** (9–10), 151–5.—The stability range of the V oxides, which occupy an especial chem and physical position, is tabulated. V_2O_5 has an especial influence on the slagging of brickwork and destruction of metallic parts. Particular consideration is given to the effect on boiler furnaces and rotary cement kilns, with soln of refractory bricks in slag. 65 literature refs. R. T.

1321. OXO-synthesis, its kinetics and related reactions. G. Natta. *BrennstChemie*, 1955, **36** (11–12), 176–81.—Reaction velocities and kinetics of the OXO-synthesis are investigated with regard to the influence of temp, total pressure, and partial

pressure of H_2 and CO in discontinuous experiments, with *cyclo*hexene as olefin and methyl*cyclo*hexane or toluene as solvent. Possibilities of the reaction are debated. The results of the investigations on the reaction between olefins, dicobaltoctacarbonyl, and H_2, also the ester synthesis from olefins, CO, and alcohols are reported. Further, the quant relations of the isomeric reaction products arising from unsymmetrical olefins and CO, and finally the OXO-synthesis with C_2H_2 in presence of methanol are communicated. R. T.

1322. Evolution of a quick method for determination of soap content in consistent solid greases. J. Kuropieska and S. Holek. *Papers Polish Inst. Petrol.*, 1954, **30**, 2–12.—Reference is made to ASTM D128–47 and saponification processes which are similar to it. Insolubility of soap in acetone can be used for its estimation. These methods are considered to be too long and laborious.

Conductometric titration (using Wheatstone bridge, amplifier, and headphones) gives a sharp end point in 1 : 4 CH_3CH_2OH and C_6H_6 soln with 5 drops of saturated soln of LiCl in EtOH and in 1 : 2 EtOH : C_6H_6 without LiCL. Titration is done using alcoholic HCl. The end point was unmistakable because cell resistance with each added drop of HCl–EtOH decreased rapidly.

Low solubility of some reaction products must be considered, and often some 10 minutes are required before equilibrium is reached. The reaction is $RCOOM^1 + HCl \longrightarrow RCOOH + M^1Cl$. Due to low ionization of $RCOOM^1$ initial resistance is high. If only ½ minute elapses between successive additions of HCl the curve has different shape, but the end point occurs in the same place and can easily be observed on a graph of conductivity. Excess of NaOH can be first removed as carbonate (insoluble in EtOH–C_6H_6); excess of $Ca(OH)_2$ has to be evaluated separately. NaOH can be separated from $Ca(OH)_2$ if present together due to their different reactivity with CO_2. Slightly different methods are required for the determination of Ca soaps and Na soaps. These are given. Times required are directly related to size of sample, whilst accuracy is inversely proportional. Results are tabulated and errors analysed. A volumetric method consists of extracting the lubricant with conc HCl and petroleum ether in a Soxhlet and then titrating the ethereal layer with KOH using phenolphthalein or alkaline blue. Foaming is troublesome, and extraction must take *ca* 4 hr, but a large quantity can be used. Lubricant can also be dissolved in benzene and soap precipitated with acetone. The ppt is then filtered, dissolved in C_6H_6–EtOH, and after these are evaporated off weighed directly. These last 2 methods are considered inferior to the new one. M. S.

1323. The structure of soap dispersions in mineral oils. C. Rossi and L. Quarleri. *Chim. e Industr.*, 1955, **37** (7), 534–7.—The nature of the dispersion of soap in hydrocarbons has been investigated, in particular in the systems known as lub oils. Sodium, calcium, lithium, and aluminium soaps have been employed. Hypotheses of the structure are presented and discussed with the help of the observations made with the electron microscope. The different aspects and properties of the fats must be ascribed to the micelles of the soaps which, depending on their solubility and swelling in oil, may remain dispersed in small agglomerates (as in the case of the aluminium soaps) or conglomerate in gel-like fibrous and reticular structures. (Authors' summary.)

1324. Plasticity index and pH of soils show little correlation. B. M. Gallaway. *Rds & Str.*, 1955, **98** (6), 98.—In order to speed up the determination of quality of soils, an attempt was made to correlate pH with plasticity index. This involved carrying out direct pH readings on natural soils, pH and settlement readings after adding up to 10% of lime, and pH readings after treatment with buffer soln. No correlation was established. R. H.

1325. Nomogram for determination of excess air in combustion. A. P. C. Cumming. *J. Inst. Fuel*, July 1955, **28** (174), 342.—A nomogram is presented from which percentage of excess air can be read off as soon as the flue-gas analysis is known. The nomogram can be applied to the combustion of all fuels, gaseous, liq, or solid, which produce on combustion only CO_2, SO_2, H_2O, CO, and H_2 or any mixture of these, but not those which contain gaseous inerts. It covers the range up to 500% excess air with readable accuracy of approx 1%. D. K.

ANALYSIS AND TESTING

1326. Crude oil evaluation. A. Crozier, Y. L. Gladel, and A. Guillemin. *Rev. Inst. franç. Pétrole*, 1955, **10**, 414–46.—Review. Brief account of petroleum constitution and of analytical methods for determination thereof, followed by description of lab method of crude evaluation and detailed results obtained therewith on 7 crudes from France and French Union. Final main section describes (with flow diagrams) IFP pilot plant installation for complete crude assessment (atm and vac dist, de-asphaltizing, solvent extraction, dewaxing, cracking). 80 refs. V. B.

1327. Importance of graphic–statistical analysis for mineral oil investigation. H. J. Waterman. *BrennstChemie*, 1955, **36** (11–12), 169–76.—Graphical–statistical methods, referred especially to the analysis of mixtures of analogous materials, are reported. Physical magnitudes susceptible to variations in structure are used preferably. These are d and its change with temp, n at different λ and temp, different spectra, mean mol. wt. and mol. vol., magneto-optic rotation, magnetic susceptibility, surface tension, visc at various temp, supersonic speed, sp. ht., sp. ref., and sp. parachor. For the separation of hydrocarbon mixtures into fractions of different types, selective adsorption or extraction, fractional dist or mol dist, and thermodiffusion are used. Special graphical presentations give a quick conception of chem processes. In petroleum processing, in hydrogenation, polymerization, hydrofining, etc., diagrams which utilize thermodynamic magnitudes such as free formation enthalpies, are given for org S-compounds and their transformations. 15 literature refs. R. T.

1328. Octane numbers in less time. H. W. Kellog. *Oil Gas J.*, 20.6.55, **54** (7), 89.—A C.R. procedure is described, developed by Ethyl Corpn, using the standard equipment; the method is time-saving and accurate. G. A. C.

1329. The 10 per cent point slope. O. C. Bridgeman. *Oil Gas J.*, 20.6.55, **54** (7), 93.—The 10% slope, defined as the slope of the chord between 15% and 5% evaporated, is being used as a characterization variable in connexion with fuel vaporization phenomena. A few typical examples are shown on a chart. G. A. C.

1330. Improving distillates by hydrofining. W. J. Zimmeschied. *Petrol. Refin.*, 1955, **34** (5), 153.—A W. Texas dist was studied with a view to improving its quality. Lab hydrofining studies showed that, without loss of liq product, the odour and sulphur content were reduced and the burning properties were improved. R. L. R.

1331. Heavy fraction vacuum flashing. G. A. Filak, H. L. Sandlin, and C. J. Stockholm. *Petrol. Process.*, 1955, **10** (5), 651–4.—In dealing with flashing at low pressures, the best estimation methods are those of Nelson and Harvey, Edmister and Pollock, Okamoto and van Winkle, and Okamoto and van Winkle–TBP. The results obtained are not identical, and several tests were made using conventional plant equipment—3 identical refinery towers, the design and instrumentation of which are described in detail. The charge stocks consisted of residua from atmospheric dist and one asphalt-base crude oil. 3 of the 4 methods use slope and b.p. correlations to convert ASTM or true b.p. curve to flash vaporization curve. Only the last method establishes a direct relationship between ASTM distribution, flash vaporization, and flashing pressure. J. H.

1332. Continuous infra-red analysis. Anon. *Petrol. Process.*, 1955, **10** (5), 710–11.—American Cyanamid Co have installed 7 continuous improved analysers on the acetylene plant as process control instruments at the new 850 million petrochemical plant at Fortier, Louisiana, U.S.A., providing almost instantaneous indication and recording of stream analysis at critical points in the process. J. H.

1333. Mass spectrometry. G. P. Barnard. *Petrol. Times*, 10.6.55, **59** (1509), 633.—The second conference of the Mass Spectrometry Panel is reviewed. 26 papers, including 10 from abroad, were presented, and a bibliography of papers published from Sept. 1950 to June 1953 is added. Subjects covered include fundamental studies of the nature of excitation, ionization, and dissociation of mol gases following collisions with electrons or atomic ions, recent developments in mass spectrography, analytical applications for the petroleum industry, and computational aids and procedure. T. T.

1334. Attempt at application of tracer bacteria to oil-bearing areas. A. Luchter. *Papers Polish Inst. Petrol.*, 1954, **34**, 9–12.—Cultures were immersed in carbon-free soln and placed in shallow holes in various localities. Duplicates were kept in lab as controls. Known oil-bearing area was used to determine the suitability of the bacteria. Of 120 strains tested 4 were found suitable. Extensive bibliography is appended. M. S.

1335. Miocene clays in the light of thermal analysis. J. J. Glogoczowski. *Papers Polish Inst. Petrol.*, 1954, **29**, 3–11.—2 kinds of thermal analysis are known: (1) Plotting temp rise v heat input to the sample, noting loss of wt due to loss of H_2O, CO_2, or H_2S on heating. Either can be recorded directly or differentially; in particular, the former by opposing 2 thermocouples, one contained in known and the other in unknown substance. Simplified analysis ends at 500° C and full analysis at 1000° C. Analytical procedure is described with drawings. Results can be used together with X-ray analysis to identify various strata. Furthermore, conditions of sedimentation can be deduced from such data. Borehole "L2," which has been well logged before, supplied 100 samples, and "W5" supplied 73 cores. The first yields 4 types (illustrated) and the second 5 types (reproduced). Variations represented are in relative quantities of the essential components of Miocene clays. Reference is made to work on another site published in *Nafta* (*Krakow*), 1951 and 1953, by the author. This and "L2" are 20 km apart and not far from Krakow, whilst "W5" is 80 km to the east and contains more kaolin than the others. Much more work is required before the formation of Miocene can be fully understood. M. S.

GAS

1336. Dynamics of gasification. S. Traustel. *BrennstChemie*, 1955, **36** (11–12), 181–6.—A skeleton gasification theory—without any idea of finality—valuable for tech calculations, and required in modern technique, is presented. The theory rests on the laws of conservation of matter and energy and the entropy law, also on the time factor, which includes physical dynamics and chem kinetics. A series of simplifications must be accepted in relation to research and operational characteristics. In the general form the theory holds good for the direct, counter, and cross-flow processes, for stationary and fluidized fuel beds, suspended dust, and arbitrary forms of flow. When chem reactivity fails (*i.e.* when $k = 0$), it describes the pure physical exchange between more or less dense collections of solid bodies and gas. Specializations on this theory are projected. R. T.

1337. Composition of gases from the Lacq deposit. J. Buzon and J. Favre. *Rev. Inst. franç. Pétrole*, 1955, **10**, 387–90.—Analyses by mass spectrometer and low temp dist (with chem methods for S compounds) on 2 samples (well and desorbed from core), after prior removal of H_2S and CO_2. Results (vol %): CH_4, 60–75; C_2H_6, 2·5–4·2; C_3H_8, 0·5–1·2; C_{4+}, 0·7–2; H_2S, 9–17; CO_2, 9–14; N_2, 0·8–5; RSH, 0·02; COS, 0·03. V. B.

1338. Natural gas up nearly 800 per cent in 10 years. L. Goffredo. *Oil Gas J.*, 6.6.55, **54** (5), 102.—In 1954 natural gas production in Italy was 1500 M.M.c.f., and is estimated to be 120,000 M.M.c.f. in 1955, and to reach 140,000 M.M.c.f. in 1956. Tables show marketed production and L.P. gas market in Italy. G. A. C.

ENGINE FUELS

1339. Effect of olefins and of butane on road octane number. R. Guyot *et al.* *Rev. Inst. franç. Pétrole*, 1955, **10**, 447–56.—2 base fuels, Lacq S.R. (paraffinic) and Arabian cat cracked (aromatic), latter also source of olefins. Fuels were fract into 4 cuts (40–73, 73–100, 100–150, >150° C) and a series of 26 blends made, 0·05–0·1% T.E.L. used. 2 test cars (7·2 C.R. air-cooled and 7·5 C.R. water-cooled). Olefins in paraffin-base fuel give increase of road O.N. as r.p.m. increase, increasing olefin proportion in fuel increases O.N. Olefins in aromatic-base fuel cause decrease of road O.N. with increasing r.p.m; increase of 40°–73° C olefins causes rise in O.N., but increase in 73°–100° C olefins a fall. Addition of butane (10 g/litre) to paraffin-base samples previously tested gave slight increase in O.N. by Motor and Research methods but very considerable increase (approx 3 times as great) by road method, these last findings were confirmed by tests on reference fuels with and without butane addition. V. B.

1340. Fuels and lubricants for gas turbine-engined transport aircraft. K. C. Hunt. *Ingenieur, 's Grav.*, 25.3.55, **67** (12), M1–7.—The first part is devoted to fuels; attention is drawn to the engine requirements (combustion chamber) and to the aircraft requirements (tankage, fuel system). Inflammability, stability, and gum-forming tendencies of the fuels are considered, together with their availability and types. The discussion on lubricants refers to the lubrication of the main bearings and gears and to the lubrication of accessories and servomechanisms. A lubricant specification is given. 11 figs and tables. (Author's abstract.)

1341. Aircraft hydrant fuelling. Anon. *Fluid Handl.*, June 1955, (65), 148.—The first hydrant fuelling system in Great Britain has recently been completed at Southampton Airport. Fuel is delivered to storage tanks by road tankers, and is then passed to aircraft, as required, by 7 hydrants, via a dispensing trolley. The full discharge rate is 240 gal/minute, with 3 hydrants working. D. J. S.

1342. New electronic programmed test-bed controller. The IFP–PTT apparatus. R. Courtel and M. Allès. *Rev. Inst. franç. Pétrole*, 1955, **10**, 487–99.—Post office van used in urban (Paris) service was equipped with apparatus recording various engine parameters (oil and water temp, r.p.m., vehicle speed, throttle opening, acceleration, etc.); equipment used is briefly described. Results thus obtained were used (by intermediary of film carrying the various curves, scanned by light beam transforming readings into a series of voltages) for controlling operation of engine test bed (designed to take all French mass-produced engines <150 h.p). Description, in some detail, of equipment employed and a comparison of actual operation of test engine with programme. Periods when vehicle is braked by engine cannot be simulated. Various possible utilizations of such test bed (tests on oils, engines, transmissions, etc.) are outlined. V. B.

1343. Knock committee. F. Kermarrec. *Rev. Inst. franç. Pétrole*, 1955, **10**, 457–62.—IFP knock committee, now including several foreign labs, organizes co-operative study for check on octane rating methods, originally F_1 and F_2 and now being extended to F_3 and F_4. Analysis of 1954 results shows that for F_1 primary reference fuels give slightly lower results than secondary; position is reversed for F_2. Comparison of detonation meter and bouncing pin shows lower results for former for F_1 but higher (by approx same amount, 0·3) for F_2; for both methods scatter is less for detonation meter.

Constitution of committee is given and other activities (*e.g.* equipment servicing, spares) outlined. V. B.

LUBRICANTS

1344. Lubrication. Notes on types and sources of lubricants. Anon. *Auto. Engr*, 1955, **45** (5), 217.—The properties and sources of various lub oils and greases are discussed, and specific applications of greases are given. T. T.

1345. Testing and selection of gear lubricants. H. J. Watson. *Petrol. Times*, 24.6.55, **59** (1510), 662.—The David Brown disk machine (which resembles to some extent the American SAE unit) and method of use are described for the testing of gear lubricants. This machine shows that E.P. lubricants are of 2 distinct types. The coeff of friction, an important characteristic since it affects worm gears, can be determined using 6-inch centres. By combining actual tooth surface stress with rotational speed and material hardness a suitable lubricant can be determined, as shown in a table. G. A. C.

1346. Synthesis of inhibitors and additives for lubricating oils. H. Mosurski. *Papers Polish Inst. Petrol.*, 1954, **35**, 3–12.—The high loads and revolutions of modern I.C. engines require lubricants refined to a high degree of purity, also additives to improve further their good qualities and inhibitors to suppress unwanted ones. All of them must possess a lypophilic group to give them oil solubility and one or more functional groups. These used to include O and N, but now it is known that P, S, and Cl are very useful. If several functional groups are attached the additive will act in several desirable ways. The subject of this paper is the synthesis of one such additive. Following Bartley and Sunday's work in *Industr. Engng Chem.*, 1949, **41** (5), effort was made to get C_{18} fractions, since the pure substance is unobtainable. A cut forming 40% of gas oil fraction, having $n_D^{20} = 1{\cdot}4777–1{\cdot}486$, mean mol. wt. 255, and obviously including aromatic and naphthenic compounds, was refined with oleum and H_2SO_4. About a third of the hydrocarbons was lost. The remainder was chlorinated to Cl content of 12–15% (theoretical value 12·6%). The next step was a reaction with aq ammonia, which proceeded all the better the higher the degree of chlorination. 6 hr at 160°–180° C and 45–50 atm was the optimum, and the hydrolysis was then lowest. Hydroxyl group and chlorine atom, if left in the product, were beneficial to the inhibitor. All that was attempted was to approach the theoretical N content of 2·7% as closely as possible. The product contained probably about a third of the required $(nC_{18}H_{32})_2NH$. To each 100 g of mixture 18 g of P_2S_5 were added, and these were heated to 260° C for 5–8 hr. Since products were not purified at the half-way stage, there appeared several by-products at the end, apart from the $(R_2N–PS–S–PS_2)_2S$ required. Unreacted sulphine was removed from the dark, oily products. Petroleum ether extraction would have left behind the pure compound, but this step was not required for neutralization with $Ba(OH)_2$. 23% of crystalline hydrated hydroxide are added and reacted for 4–5 hr at 120°–150° C. Purification with benzene and petroleum ether follows. From 4 kg of gas oil about 1 kg of inhibitor can be obtained. Its mol. wt. was 2370 instead of theoretical 3750. Proportions of elements in it varied slightly. Similar products were obtained using as starting material kerosine, white oil, $nC_7H_{15}NH_2$, aniline, naphthylamine, and diphenylamine. It appears that where the ratio of organic to inorganic groups is much less than 10 : 7, or the organic part is aromatic, the product is insoluble in lubricant. Various cations were used with following results: $Ca(OH)_2$, introduced as aq soln, product insoluble in oils; NaOH, introduced as alcoholic soln, gives the same result; Zn, Al, Ni, Co, introduced through Na salt, give salts insol in paraffins but sol in aromatics. Starting with turpentine and P_2S_5, a satisfactory oxidn inhibitor was obtained. 91% efficiency of the reaction shows promise, and the longer the reaction proceeds, the more turpentine combines. Various salts of oleic, stearic, and sulphonic acids were prepared and found useful as dispersing agents. Analytical methods are given. Bibliography. M. S.

1347. Synthesis of detergent additives for lubricants. I. Chemical investigation. J. Artozoul. *Rev. Inst. franç. Pétrole*, 1955, **10**, 465–9.—*cyclo*Hexylbenzene and *cyclo*hexyltetraline were alkylated with ethyl-2-hexanol using BF_3 cat. Resulting products were sulphonated with SO_3 and, as Ca and Ba salts, tested for oil solubility and used for engine tests (no details). **II. Investigation by infra-red spectrometry.** J. Favre. *Ibid.*, 470–6.—Materials examined were alkylbenzenes (mono- and di-substituted), *cyclo*hexylbenzenes, and *cyclo*hexyltetralines. Spectra obtained were compared with those of various known compounds and, on this basis, probable formulæ for test materials suggested. V. B.

1348. Fundamental study of detergency in diesel lubricating oils. R. Courtel, B. Bernelin, and J. Labre. *Rev. Inst. franç. Pétrole*, 1955, **10**, 477–86.—Soot particles in used detergent oils have mean size 0·1–0·5 μ, in ordinary used oil size is 0·5–2 μ, with tendency to agglomeration. Effect of temp increase on used detergent oils was studied, flocculation in distinct successive reproducible phases occurs, with complete flocculation at *ca* 150° C. Theory of effect is discussed and is shown to be explicable on basis of recognized adsorption theory. Tests with used pure mineral oils to which detergents have been added show close correlation between flocculation and manufacturer's recommended detergent concn. V. B.

1349. Lubricants for roller bearings. S. Patzau. *Bull. Polish Inst. Petrol.*, 1954, **4**, 6 (suppl. to *Nafta* (*Krakow*), 1954, **10**).—Such lubricants should have exceptionally low visc and show no fibrous properties but have high adhesion to metal. According to tests carried out, glycerine causes the formation of long-chain fibrous soaps with Na or K. Oleic acid gives fibrous structure whilst stearic does not. High penetration is required, and here K soaps are better. High blending temp adversely affects metal adhesion, but all water must be expelled. Best results are obtained by a compromise. M. S.

1350. Sludges in engine oils. Vacuum Oil Co. Engng Memo. 1024. *Auto. Engr*, 1955, **45** (5), 202.—The formation and factors affecting the composition of sludges are discussed. Recommendations regarding counter-measures and choice of oil are given. T. T.

1351. Equiviscosity index derived from the Dean and Davis viscosity index. J. Groff. *Rev. Inst. franç. Pétrole*, 1955, **10**, 463–5.—Equivisc oils show decreasing V.I. with increasing visc (from *ca* 370 at 2 cS/210° F to *ca* 145 at 75 cS/210° F). Equivisc index, *E*, is suggested, with value of 0 for oils of V.I. 0 and of 100 for equivisc oils. $E = \frac{L - U}{L - V} \cdot 100$, where *U* and *V* are visc at 100° and 210° F respectively and *L* is from ASTM D-567. V. B.

BITUMEN, ASPHALT, AND TAR

1352. Bituminous materials, their processing and use mirrored in the newer German patent literature. H. Hoffmann. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (5), 176.—Detailed descriptions. Continuation from vol. 12, 1954. R. T.

1353. Microbes as cause of bitumen destruction. T. Temme. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (5), 161–4.—Few hydrocarbons are unattacked by microbes. A sp. case of bitumen insulation destruction on the digesting container—iron on cement foundation—of a sewage purification plant is discussed, with supporting photographs. All tech requirements for the bitumen coating and its application were observed. The ability of bacteria to oxidize hydrocarbons increases with mol size and chain length. Branched-chain hydrocarbons are more easily oxidized than straight-chain ones. With few exceptions olefinic compounds are more easily oxidized than corresponding paraffinic. Naphthenic hydrocarbons are oxidized very easily by some bacteria. It follows that bitumen—of aliphatic–naphthenic nature—is attacked very easily. Products of bacterial oxidn change

with type of hydrocarbon, type of bacteria, and their life conditions. It is concluded that destruction of the bitumen coating on the sewage container is due to the action of the numerous bacteria present, many of which attack hydrocarbons. On roads, destruction of bitumen can occur near turf edges where microbes luxuriate. R. T.

1354. Development of bituminous all-weather binders. K. Raschig. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (4), 111–12; **6** (5), 168–71.—All-weather binders—developed to meet sp. conditions—are discussed fully and compared in properties and applications with other bitumen binders. Chief advantages are long stability and use in wet, cold conditions. R. T.

1355. Footfall-noise insulation without floating floors. N. Jungewelter. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (4), 108–10.—An illustrated article showing various noise-insulating constructions in which bitumen and bitumen emulsions are used. R. T.

1356. Asphalt mats in hydraulic construction. E. Flister. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (4), 116–17.—Asphalt masses, with jute, hemp, sisal, wire netting, or welded steel netting inlays, are used for protecting hydraulic constructions against erosion. Applications of these stable, strong materials in mat form are discussed, with supporting diagrams. R. T.

1357. Development and properties of VT-road tars. H-G. Franck. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (5), 147–51.—A process—largely independent of tar and bitumen types—for developing completely homogeneous new-type tar—bitumen road binders in any desired mixing ratio, is discussed. These VT-road tars combine in themselves the good properties of tars and cutback bitumens, and this most favourably with equal pitch and bitumen cont. Composition and properties of the new tars are discussed. R. T.

1358. Comparative investigations of different distillation processes for road tar. A. Schmitt and E. Dinkloh. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (5), 152–60.—An investigation is reported on the separative effect of different dist processes standardized in various countries for road tars, and of 2 processes proposed by German authors. The experiments, carried out on the binary system α-methylnaphthalene–cetane, are compared with separation on a rectifying column chosen arbitrarily. Evaluation of the experimental results is expressed in 2 curve types, concn and integration. From the latter is obtained a dimensionless coeff which expresses the separative effect of the individual processes. Dist. results for a road tar, placed in parallel to those of the binary system, give theoretically important conclusions for the definition of the conventional tar oil fractions. R. T.

1359. Information on the physicochemical principles of recovery and decomposition of phenol fractions from coal tar and brown coal low-temperature-carbonization tar. E. Terres *et al. BrennstChemie*, 1955, **36** (11–12), 162–9.—Report II. Information on chromatographic procedure for separating and identifying phenols and phenol derivatives. Appliances and procedures for chromatographic technique, which have proved successful, are discussed with extensive refs to relevant literature. An extremely sensitive reagent, after Folin-Denis, for phenol detection, hitherto unused in the realm of chromatography, is communicated. 111 literature refs. R. T.

SPECIAL HYDROCARBON PRODUCTS

1360. An effective mould inhibitor. L. J. Hayhurst, R. U. Hussong, and E. K. Nielsen. *Mod. Packag.*, May 1955, **24** (9), 127.—Experiments with dimethyl dichlorosuccinate as an anti-mycotic agent show its efficacy in wax coating on cheese wrappings. Tables show mould development on various cheeses during storage periods at 45° F. G. A. C.

DERIVED CHEMICAL PRODUCTS

1361. England's petrochemical giant. V. S. Swaminathan. *Petrol. Process.*, 1955, **10** (5), 703–6.—At I.C.I.'s works at Wilton, in essentially an operation for producing ethylene and propylene petrochemicals, liq oil fractions are used rather than gases as raw materials. 16 plants will be operating at Wilton before the end of 1956. J. H.

1362. Faster hydrochlorination of styrene. Anon. *Petrol. Process.*, 1955, **10** (5), 707–8.—Results of work by the Dow Chemical Co in packed absorption columns show important advantages of continuous cat hydrochlorination of styrene over the batch work. The reaction reacts anhydrous, gaseous hydrogen chloride with styrene by addition across the vinyl double-bond to produce α-chloroethylbenzene. Main advantages include considerable saving in anhydrous hydrochloric acid, increases in hydrochlorination rates up to 6-fold, and better temp control—decreasing styrene polymer formation. J. H.

1363. A new valve for the chemical industry. Anon. *Fluid Handl.*, June 1955, (65), 157.—A new silicon–iron valve is described, which is claimed to be leakproof and easy to operate. Lubrication is by ducts in grooves cut in the plug. A table is given which shows the resistance of the silicon–iron concerned to various corrosive liquors. D. J. S.

COAL, SHALE, AND PEAT

1364. Progress Review No. 34. The constitution of coal. L. Horton. *J. Inst. Fuel*, June 1955, **28** (173), 300.—Aspects considered are: the maturing of coal, chemical, statistical, and X-ray studies. D. K.

MISCELLANEOUS PRODUCTS

1365. The properties and applications of epoxide resin esters. R. N. Wheeler. *Paint Tech.*, May 1955, **19** (212), 159.—One method of employing epoxide resins in the surface coating industry involves esterification of resins with carboxylic acids, usually vegetable oil fatty acids. These esters are being used in air-drying and in stoving finishes in increasing quantities. The method of manufacture of these finishes and their application is discussed. D. K.

CORROSION

1366. Some corrosion inhibitors—a reference list. NACE Technical Unit Committee T-3A. *Corrosion*, 1955, **11** (4), 195–7t.—68 inhibitors are listed with chemical and trade names, use, and other information, including literature refs. W. G. R.

1367. Summary of data on use of structural plastic products in oil production. NACE Technical Committee T-1J. *Corrosion*, 1955, **11** (6), 59–69.—The report covers results of a questionnaire survey to determine experience to date. The most quantitative data developed by the survey were the strapping data on a 250-brl glass-polyester and a like-size glass-epoxy tank. After 2 years the glass-polyester tank was still creeping and subject to 0·152% vol change due to temp difference between winter and summer. Not enough data are available on the glass-epoxy tank to determine creep rate, but it was noted that the volume change between winter and summer was *ca* 0·10%.

3 appendixes dealing with plastic linings and tubing are included. W. G. R.

1368. Laboratory development of corrosion inhibitors. L. W. Jones and J. P. Barrett. *Corrosion*, 1955, **11** (5), 217–20t.—The procedures used by a major oil company lab to develop a new series of corrosion inhibitors are presented. A review of the history of the inhibitors illustrates a pattern of develop-

ment work which started by finding a material to solve a specific problem and expanding the solution to related problems. W. G. R.

1369. Neutralizers and inhibitors to-day. R. J. Hafsten and K. A. Walson. *Petrol. Refin.*, 1955, **34** (5), 163.—Modern corrosion prevention practices are summarized, and tables are given to show the use of neutralizers and inhibitors, separately and in combination. R. L. R.

1370. Some current practices for reducing refinery corrosion. G. L. Farrar. *Oil Gas J.*, 6.6.55, **54** (5), 120.—This is a résumé compiled from technical papers, informal discussions, and symposia presented at the recent annual meeting of the National Association of Corrosion Engineers in Chicago. Injection of air into refinery process units to halt hydrogen penetration of steel and use of organic corrosion inhibitors to reduce corrosion are included in the account. G. A. C.

1371. Material selection for condenser tubes. H. A. Todhunter. *Corrosion*, 1955, **11** (5), 221–6t.—Factors involved in the design and operation of sea water condensers, such as water conditions and design factors, are discussed. Specific cases are cited, including methods considered and used to regulate animal and plant life. Effects of chemicals, galvanic action, and design of tubes of various alloys are explored. An appendix gives a brief history of 1500 tubes installed in a sea water condenser. W. G. R.

1372. An automatic circuit interrupter for use in cathodic protection system design. L. Schwalm. *Corrosion*, 1955, **11** (6), 254t.—An instrument to predetermine the amount of current needed to protect the structure under consideration is briefly described. W. G. R.

1373. Reports to Technical Unit Committee T-1J on oilfield structural plastics. Pt 1. Long-term creep of pipe extruded from tenite butyrate plastic. L. W. A. Meyer and R. J. Scogin. *Corrosion*, 1955, **11** (6), 277–83t.—9-ft lengths of pipe were maintained under different internal pressures. Data are given in 16 graphs showing individual creep data and 4 graphs summarizing each of 4 groups. Tables are given showing safe hoop stress values with corresponding tensile strength data. W. G. R.

1374. Reports to Technical Unit Committee T-1J on oilfield structural plastics. Pt 2. Structural behaviour of unplasticized geon polyvinyl chloride. G. F. Malone. *Corrosion*, 1955, **11** (6), 283–7t.—Reports of an investigation of the effects of temp on the physical properties of geon non-plasticized polyvinyl chloride and the effect of temp on short-term tensile properties are given. The tests show that at relatively low stresses the deflexion and rate of creep are directly proportional to the applied stress. Above some stress limit, varying between 2200 and 3000 p.s.i., deflexion and rate of creep increase very much faster than stress. A minimum safety factor of 5 to 1 or 20% of ultimate tensile strength should be used. W. G. R.

1375. Tentative procedures for preparing tank car interiors for lining. NACE Task Group T-3E-1. *Corrosion*, 1955, **11** (6), 69–70.—Tentative procedures as a guide to improved control of tank car corrosion are given. Attention is drawn to cleaning, inspection and repair, blasting for surface preparation, and painting. W. G. R.

1376. A practical method for cleaning and descaling cargo tanks contaminated with black oil residues. J. F. Mills, F. E. Cook, and H. S. Preiser. *Corrosion*, 1955, **11** (5), 200–4t.—A method for removing black oil residues from tanks is described. The cycle of operations includes ventilation of the tank, sludge removal, steaming at 100 p.s.i. to 175°–180° F, and injection of an emulsion cleaner, finally followed by cold water washing.

Electrolytic descaling is effected by making the inner tank walls the cathode of an electrical circuit with the tank filled with a suitable aq electrolyte. W. G. R.

1377. Electrolytic descaling. F. E. Cook, H. S. Preiser, and J. F. Mills. *Corrosion*, 1955, **11** (4), 161–81t.—A detailed report of the theory, technique, and application of electrolytic de-rusting of cargo tanks of U.S. Navy tank ships is given. Details of the lab investigations preceding the application of the descaling method, together with a report on descaling of 9 ships, are included. W. G. R.

1378. Corrosion in oil well casing by earth currents. L. de Witte and F. J. Radd. *J. Petrol. Tech.*, 1955, **7** (4), AIMME Tech. Paper No. 4033, 66–72.—Casing failures can be directly related to electrical currents observed in the casing in some areas, and it is suggested that these currents are due mainly to electrochemical potentials of the type evidenced in S.P. logs. The nature of these potentials is discussed. These potentials are short-circuited by the casing, and this averages the effects of local cells.

Current patterns predicted from S.P. logs agree closely with measured current profiles in the salt mud area of Kansas. A method of obtaining the casing current distribution from S. P. curves is described.

In many fields outside casing corrosion may be mitigated by removing open-hole S.P. before setting casing. When salt sections are not present or can be cemented off, this can be achieved by making the salinity of the mud equal to the average salinity of the formation waters occurring between the surface pipe shoe and the top of the oil string cement.

G. D. H.

1379. Coating pipelines in place internally with plastics. J. C. Watts. *Corrosion*, 1955, **11** (5), 210–16t.—Factors to be considered when planning an internal coating job are given. The principal problem is in the surface preparation, and the author recommends a scheme involving successive cleaning by abrasion, solvent cleaning, alkaline cleaning, and acid cleaning with the necessary intermediate washings. Drying is effected best by aspiration until the coating is thoroughly dry.

Data on the economics of internal coating are included.

W. G. R.

1380. Electrical protection of buried pipelines. S. Pawlikowski. *Nafta (Krakow)*, 1954, **10** (5), 109–13.—Author describes the coatings used to protect pipes and the reasons for their breakdown, explaining the mechanism of electrical and non-electrical corrosion, including the bacteriological influence. For protection it is necessary to make the pipe the cathode in a circuit fed with 0·1–20 kW or by laying a rail of more electropositive metal alongside. Since the pipeline is one of the conductors, attention must be paid to presence of lubricants which act as insulators. Technical details follow.

M. S.

1381. Economic considerations in pipeline corrosion control. L. G. Sharpe. *Corrosion*, 1955, **11** (5), 227–40t.—3 major corrosion problems encountered in pipeline operation are considered. They are: (1) internal corrosion in sour crude oil pipelines; (2) external corrosion of oil storage tank bottoms; (3) external pipe coatings and cathodic protection. Experience with the various corrosion control methods is described and the economics of their use is examined. The paper is followed by a discussion. W. G. R.

1382. Control of internal corrosion of a products pipeline system. P. L. DeVerter and A. W. Jasek. *Corrosion*, 1955, **11** (6), 261–6t.—Corrosion control in a single 8-inch products pipeline transporting only premium and regular grades of motor fuel and 100 and 115 grades of aviation gasoline is discussed. A water soluble inhibitor was used for several years, but because the degree of protection desired was not realized and, because the protection ended at the pipeline terminus, an oil soluble inhibitor was substituted. The results indicated that benefits realized by the use of an oil soluble inhibitor more than offset its higher cost compared with the water soluble type. W. G. R.

1383. Current requirements for cathodic protection of pipelines. M. E. Parker. *Corrosion*, 1955, **11** (4), 182–8t.—Methods are suggested to find the best and most economical way to drain sufficient current from certain selected points on the line to give adequate protection. Problems, such as obtaining electrical continuity where joints, other than welded, are used and insulating the line from other buried structures, are outlined.

Also discussed are such questions as technique for taking potential readings, where the electrode should be placed to take such readings, various means of plotting data for best use, etc. W. G. R.

ENGINES AND AUTOMOTIVE EQUIPMENT

1384. Running diesels on low grade fuel. Anon. *Mech. World*, 1955, **135** (3430), 202.—Tests have been carried out on a 621-b.h.p., 3-cyl supercharged Mirrlees diesel engine using heavy fuels with visc of 220, 950, 3500, and 6000 sec Redwood I at 100° F. Successful and economic operation on an experimental engine was achieved after overcoming various troubles. Nickel–chromium coated silicon–chromium steel exhaust valves gave satisfactory performance. T. T.

MISCELLANEOUS

1385. What we will be making in ten years. A. L. Lyman. *Petrol. Refin.*, 1955, **34** (5), 139.—A forecast has been made, based on current trends, of the demand in the U.S.A. for gasoline, dist, residual fuels, petrochemicals, and other products. Each type is discussed in detail, and the problems of refineries in 1965 are mentioned. Several graphs are used to illustrate points made. R. L. R.

1386. Europe's energy in the future. A. R. McDowall and H. C. L. Mason. *Inst. Petrol. Rev.*, 1955, **9** (97), 1–3.—The demand for energy is associated particularly with the level of economic activity, and generally it has been found that a 10% increase in industrial productivity is accompanied by a 6% increase in energy demand. On this basis and on the assumption that industrial production in W. Europe will continue to rise at *ca* 3% p.a., it is possible to estimate the demand for energy. In 1953 energy was obtained from oil, coal, hydro-electric power, and natural gas. The increased production of coal in the next 25 years is not estimated to be large and while hydro-electric development has been extensive since 1945, its contribution in the immediate future will not be very large. Similar considerations apply to natural gas, and so while atomic energy will no doubt make some contribution, the major burden of the increase will fall on oil, a burden which it should not be impossible to meet. R. H.

1387. The Presidential Address, 1955. "Fuel and Power Research in Britain." W. I. Jones. *J. Inst. Fuel*, June 1955, **28** (173), 262.—Aspects considered are: fuel research organization in Britain; main research purposes; research on fuel production; and research now in progress, *e.g.* coal production, hydraulic transport of coal, boiler deposits and boiler availability, efficient combustion of coal in stoke-fired boilers, oil research, wind power, gas turbines, complete gasification of coal, underground gasification, natural gas and mine methane, production of solid smokeless fuels, and domestic applications. D. K.

1388. The place of service companies in the oil industry. R. Henquet. *Bull. Ass. franç. Tech. Pétrole*, March 1955, (110), 123–35.—The development of the American oil industry and of its use of service companies is briefly outlined. In France the structure of the industry was very different, and until recently activities in certain directions were insufficient to warrant the existence of service companies. Such organizations can, when the amount of work justifies them, offer considerable advantages. The personnel, by repeatedly executing a given operation, acquire skill which otherwise would be difficult to obtain. The companies can assemble men and equipment on a scale which would not be justified individually in a number of operating companies. Furthermore, it is possible to keep abreast of the times with new equipment because of its greater use, and also to embark on suitable research. Service companies can, in the appropriate environment, give great efficiency and economy. G. D. H.

BOOK REVIEW

Petroleum in Venezuela. Edwin Lieuwen. Berkeley, California; University of California Press, 1955. Pp. 160. $3.

A well-documented history of petroleum in Venezuela has been presented by Mr Lieuwen. He traces the vicissitudes of the petroleum industry under various regimes from 1899 to 1952 and gives a critical analysis of the methods employed both by it and the Government against the background of the State's economy. Eight chapters cover reasonably well-defined periods of development, and the ninth, which might better be placed at the beginning, affords a balanced summary and conclusions.

As one who considers himself fortunate to have begun his petroleum career in the Maracaibo Lake basin fields of the twenties, Chapter IV, Boom Era (1922–1929), brings pleasant memories. Perhaps our methods, by present-day standards, were rough and ready and our interpretation of "good oilfield practice" was certainly less scientific, but nevertheless, when describing the offset drilling of the Bolivar coastal fields it is hardly correct to state that "the companies, draining a common reservoir, abandoned chokes and allowed wells to flow wide open." A well spacing pattern was accepted by the three offsetting companies along the kilometre strip, and offtake and gas–oil ratios were regulated by mutual agreement. The author stresses that both the oil fraternity and President Gomez were individualistic, unco-operative, oblivious of the welfare and interests of the republic. "It was every man for himself. . . . A Government that knew nothing and cared less about prorationing and efficient production methods gave the exploiters free reign. Short-range cash considerations were what counted for both Gomez and industry. So the companies extracted as rapidly as they could." To state such opinions is the author's prerogative, but their acceptance, against the industry's methods of 30 years later, does call for some sympathetic consideration of the pioneer work of these old-timers which made possible today's understanding of conservation principles.

The introduction of income tax and the 1943 Law of Hydrocarbons mark a turning point in the Venezuelan petroleum industry. Many features of the mining legislation have been adopted by other countries, and the 1948 Amendment to the Income Tax Law, widely known as the 50–50 tax, has set the pattern of profit-sharing between State and Concessionaire. The effect of these measures, as well as the status of the petroleum worker, are developed in the later chapters.

Mr. Lieuwen's research has been thorough, and if his views and opinions seem, at times, provocative, it is not because our elders' actions in the past are often thoughtlessly judged by youth's infallability. J. B. K.

ABSTRACTS

	PAGE
OILFIELD EXPLORATION AND EXPLOITATION	
Geology	149 A
Geophysics and Geochemical Prospecting	152 A
Drilling	152 A
Production	153 A
Oilfield Development	154 A
TRANSPORT AND STORAGE	154 A
REFINERY OPERATIONS	
Refineries and Auxiliary Refinery Plant	155 A
Distillation	155 A
Solvent Extraction and Dewaxing	155 A
Cracking	155 A
Chemical and Physical Refining	155 A
Metering and Control	155 A
PRODUCTS	
Chemistry and Physics	156 A
Analysis and Testing	156 A
Gas	157 A
Engine Fuels	157 A
Gas Oil and Fuel Oil	157 A
Lubricants	157 A
Special Hydrocarbon Products	160 A
Coal, Shale, and Peat	160 A
Miscellaneous Products	160 A
CORROSION	160 A
ENGINES AND AUTOMOTIVE EQUIPMENT	161 A
BOOK REVIEWS	161 A
ADDITIONS TO THE LIBRARY	162 A

AUTHOR INDEX

The numbers refer to Abstract Numbers

Albert, A., 1449
Arich, G., 1453
Banerjea, S. K., 1465
Bates, S., 1494
Betteridge, W., 1505
Bhatnagar, S. S., 1432
Bidwell, J. B., 1484
Bisschop, M. C., 1447
Bockman, T. V., 1439
Braendle, R. O., 1485
Brock, J. J., 1459
Brooks, T. P., 1425
Browning, W. C., 1420
Brüninghaus, L., 1436
Brunner, M., 1476
Buttin, R., 1405
Cannon, R. S., 1439
Carozzi, A., 1413
Carter, C. F., 1455
Caudle, B. H., 1427
Cismic, N., 1419
Cloud, P. E., Jr., 1389
Cogliano, J. A., 1463
Cornell, D., 1422
Costantinides, G., 1453
Dapples, E. C., 1397
Davies, R., 1482
Decker, W. H., 1442
Dempsey, B. J., 1473
DeWitt, T. W., 1454
Donahue, R. W., 1464
Dreher, J. L., 1455
Duggan, M., 1503
Duramdet, J., 1441
Eddi, R., 1465
Ellis, E. G., 1481, 1490–1
Elyash, L. J., 1454
Erickson, R. A., 1427
Eugene, F., 1493
Fagegaltier, R., 1458
Farrington, B. B., 1466
Fenske, M. R., 1475
Flamand, M., 1470
Fuchtbauer, H., 1409
Fuhs, R. C., 1443
Fuller, D. D., 1479
Fuller, M., 1495
Gallitelli, P., 1414
Gardner, F. J., 1402–3, 1502
Gerault, M. A., 1501
Girelli, A., 1451
Gladel, Y. L., 1441
Graham, H., 1495
Graziani, F., 1441
Groff, J. L. E., 1497
Gussow, W. C., 1391
Hahn, O., 1448
Hale, A. R., 1502
Hancock, H. M., 1450
Hansen, K., 1410
Harnsberger, W. T., 1392
Hellin, M., 1466
Holmes, S. B., 1468
Hutton, J. F., 1474
Imbrie, J., 1399
Ireland, H. A., 1398
Jessup, R. S., 1463
Jodry, R. L., 1390
Johnson, R. H., 1483
Jones, H. H. M., 1440
Jungers, J. C., 1446
Kiemstedt, H., 1506
Killingsworth, R. B., 1467
King, J. A., 1478
Klaus, E. E., 1475
Krpan, D., 1460
Lahee, F. H., 1418
Landers, J. E., 1504
Laval, R., 1470
Legrand, M., 1500
Leloup, L., 1472
Lester, G. W., 1426
Lewis, H., 1505
Life, W. E., 1425
McClure, C., 1433
MacDowall, J. M., 1423
MacQuown, W. C., Jr., 1400
Mahncke, H. N., 1486
Manson, N., 1465
Mapstone, G. E., 1449
Markovitz, H., 1464
Mathieu, J. L., 1431
Mathews, J. B., 1474
Meyer, G. C., 1485
Meyer, H. J., 1457
Millikan, W. E., 1400
Morrisey, N. S., 1417
Mosteller, J. C., 1478
Murray, G. E., 1396
Nichols, C. W., 1467
Nowak, T. J., 1426
Oevirk, F. W., 1477
Olansen, M. A., 1428
O'Quinn, P. C., 1425
Orchard Lisle, B., 1437
Organick, E. J., 1457
Osoba, J. S., 1424
Padden, F. J., 1454
Palcari, C., 1451
Pedrini, R., 1476
Perkins, F. M., 1424
Perthuis, E., 1461
Phleger, F. B., 1394
Pivnick, H., 1495
Poustovalov, J., 1416
Power, W. R., 1462
Pugh, W. M., 1489
Reid, E. B., 1455
Riba, O., 1415
Richardson, J. G., 1424
Rosser, W. H., 1430
Roth, R., 1393
Sachs, K., 1505
Sakamoto, T., 1407
Salé, B., 1461
Scarlett, N. A., 1474
Schwenker, R., 1478
Sharpe, G. C. H., 1488
Shock, D. A., 1504
Shor, G. I., 1496
Siniramed, C., 1451
Slobod, R. L., 1427
Snow, H. A., 1471
Socolofsky, J. F., 1467
Somers, F. C., 1443
Stewart, D., 1442
Sudbury, J. D., 1504
Swerdloff, W., 1503
Tabor, W., 1486
Thomas, F. M., 1456
Tichvinsky, L. M., 1489
Tollenaar, D., 1447
Tong, R. W., 1480
Tropper, H., 1498
Uyeno, S., 1495
van der Heyden, H. C., 1435
van Leckwijck, W., 1408
Vatan, A., 1412
Vincent-Genod, J., 1508
von Hahn, B., 1445
Wallace, R. A., 1435
Walton, P. T., 1401
Watson, F. G., 1452
Watt, J. J., 1450
Weismantel, E. E., 1487
Wessing, W., 1434
White, H. M., 1468
Young, R. S., 1392
Zaslavskii, Yu. S., 1496
Zein el-Dine, M. R., 1498

OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

1389. Physical limits of glauconite formation. P. E. Cloud, *Jr. Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 484.—In this paper the author surveys the available records, which indicate that the formation of glauconite requires marine water near normal salinity, reducing conditions, and appropriate source materials. It is favoured by high organic content of the bottom sediments in which it forms, and by slow or negative sedimentation. It may form under a fairly wide but not unlimited range of temp and depths. He concludes that this variety of limiting factors combines with the general ease of field recognition to make glauconite much more useful in paleoecology than other accessory minerals which are so far known to provide clues to depositional environment. E. N. T.

1390. Rapid method for determining magnesium–calcium ratios of well samples and its use in predicting structure and secondary porosity in calcareous formations. R. L. Jodry. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 493.—As an aid in discovering new oilfields in the area of the Rogers City dolomite in the Michigan basin in the U.S.A. a method of sample analysis has been devised based on the Versenate method, which quickly gives the magnesium–calcium ratio of well samples. A study of these ratios shows that dolomitization of the Rogers City limestone occurs at 2 places: (1) on the apices of folded structures, as a result of solution and replacement by ascending waters along tension fractures; and (2) in long narrow bands, the result of high-magnesium waters ascending faults and master fissures. E. N. T.

1391. Time of migration of oil and gas. W. C. Gussow. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 547.—The author points out that in spite of the fact that the petroleum industry is a century old, many problems of migration and accumulation have yet to be solved. He suggests that time of migration may be determined by an analysis of: (1) compaction, which is a function of depth of burial and governs the time of primary migration or expulsion of hydrocarbons out of the source beds; (2) time of regional tilt, which initiates lateral or secondary migration; (3) time of formation of traps; (4) hydrostatic pressure, which governs the gas capacity of traps and determines the earliest time of final accumulation; (5) saturation or bubble-point pressure, which is a function of depth of

burial at time of migration and fixes the time of final accumulation; (6) history of lithologic development, that is, time of cementation and mineralization, time of development of secondary porosity, etc.

Based on the above reasoning, the author suggests the source of some Alberta crude oils. E. N. T.

1392. Geology of Bergton gas field, Rockingham County, Virginia. R. S. Young and W. T. Harnsberger. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 317.—The purpose of this paper, which is part of a comprehensive regional study by the Virginian Division of Geology, is to describe the geology of the Bergton district of Rockingham County, Virginia, and to bring up to date the history of exploration and development in that area, where a small potential gas field has been partly de-limited by recent drilling.

The major structural elements of the area are complex folds. It is suggested that local doming should present favourable areas for future exploration. E. N. T.

1393. Paleogeology of Panhandle of Texas. R. Roth. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 422.—The Panhandle area of Texas is situated in the S. part of the Great Plains of the U.S.A.

Cuttings from hundreds of wells drilled in the Panhandle have been examined and fossil content identified. Using this information as a base, the stratigraphic column has been subdivided into 14 time–stratigraphic units. The lithologic character and orogenic environment of each unit are briefly described, and an isopachous figure portrays the areal distribution. Petrographic analyses have been made of pre-Cambrian rocks encountered by the drill. E. N. T.

1394. Ecology of foraminifera in Southeastern Mississippi Delta area. F. B. Phleger. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 712.—This is one of a series of reports dealing with various aspects of the sediments and oceanography of the nearshore area on the SE. Mississippi Delta in connexion with API Project 51. The purposes of this report are: (1) to describe the distribution patterns of the foraminifera in this area, and (2) to attempt to interpret these distributions in terms of what is known of environmental factors in this area and of distributions in other areas. E. N. T.

1395. Gulf field found. Anon. *Oil Gas J.*, 20.6.55, **54** (7), 78.—A new field has been found in the Gulf of Mexico off the coast of Louisiana; the discovery is in the Eugene Island area, 30 miles from St Mary Parish, and initial flow was 132 b.d. of 39·5° oil from a Miocene sand perforated from 10,110–10,116 ft.

Another field has also been found 45 miles to the SE. in the Ship Shoal area, where the discovery produced gas and condensate from 10,298–10,304 ft. C. A. F.

1396. Midway Stage, Sabine Stage, and Wilcox Group. G. E. Murray. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 671.—The author points out that the failure to differentiate fundamentally between rocks, their times-of-creation, and other rocks originating wholly or in part simultaneously, not only impedes interpretations of the natural geological history of the region but confuses beginners and others who may have only superficial or occasional contact with the terminology.

He applies this reasoning to a clarification of the terms Midway Stage, Sabine Stage, and Wilcox Group. E. N. T.

1397. General lithofacies relationship of St Peter sandstone and Simpson group. E. C. Dapples. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 444.—The thesis expanded here is not concerned directly with the problems of assigning age determinations to the Simpson, Everton, or St Peter, but with the aspects of sedimentation which have produced this essentially continuous body of rock. Except for the upper part of the Simpson, which is primarily carbonate, the Simpson and Everton–St Peter constitute a sheet of clastic sediment between upper and lower, extensive bodies of carbonate rocks. The Simpson can be visualized as a widespread, clastic deposit in which shale dominates; the Everton–St Peter as a geographic extension of the same unit dominated by sandstone. The present study is concerned with this clastic sheet, whose areal extent and continuity can be established.

Particle-size distribution of sandstone of the Simpson parallels that of the St Peter and suggests genetic relationship of the source material. Distribution and position of the shale and carbonates indicate a northern source of clay and sand débris. E. N. T.

1398. Pre-Cambrian surface in Northeastern Oklahoma and parts of adjacent states. H. A. Ireland. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 468.—The purpose of the paper is to show the pre-Cambrian surface as it existed prior to the deposition of the Paleozoic sediments, to comment on the topography shown, and to make available a revised and as nearly accurate as possible list of all wells to the pre-Cambrian in the area.

A map showing the original thickness of the pre-Simpson beds indicates the topography of the pre-Cambrian surface. This map gives a picture entirely different from a map drawn on the present elevation of the top of the pre-Cambrian, because the surface is rotated upward to a datum from depths up to 3700 ft subsea elevation.

A large, rugged, very obvious highland with relief of 1800 ft is called Tulsa Mountains. It slopes in all directions and has several major extensions. There is a lowland in S. Kansas, and 3 local highlands are in the extreme NE. corner of Oklahoma, one of which involves a pre-Cambrian fault at Miami. E. N. T.

1399. Quantitative lithofacies and biofacies study of Florena shale (Permian) of Kansas. J. Imbrie. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 649.—The investigation here outlined is designed to develop a procedure for identifying and describing significant relationships between lithologic and paleontologic characteristics of a stratigraphic unit. 3 steps are involved in the method: (1) field study involving channel-sampling of a widely traceable stratigraphic unit; (2) lab study designed to produce quantitative data on both lithofacies and biofacies changes; and (3) synthesis of the data so obtained by direct plotting of lithofacies against biofacies.

The unit selected for analysis is the Florena shale member of the Beattie limestone (Wolfcampian), a fossiliferous unit traceable across Kansas from Nebraska to Oklahoma. E. N. T.

1400. Little Beaver, Badger Creek, Middlemist field area, Colorado. W. C. MacQuown, Jr., and W. E. Millikan. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 630.—The Little Beaver, Badger Creek, Middlemist field area lies within 4 townships in Washington and Adams counties, 65 miles E. of Denver, Colorado.

Oil is produced from permeable sands lying within more or less continuous, impermeable, grey, impure, sandstone and siltstone zones deposited in a shallow marine shelf sea during the Cretaceous period. Structural closure is almost absent, and oil is found on small structural terraces.

5 critical isopachous intervals in addition to structural data are important in localizing producing sand lenses. These structural and isopachous criteria may be useful in extending present producing fields and in finding other lenticular sands in the Denver basin. E. N. T.

1401. Wasatch Plateau gas fields, Utah. P. T. Walton. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 385.—The mountainous area called the Wasatch Plateau extends from Soldiers' Summit 75 miles S. to Salina Canyon, and from the Book Cliffs on the E. to the Sanpete–Sevier valley on the W., a distance of nearly 25 miles. The plateau is underlain by Upper Cretaceous and Paleocene, low-dipping, sedimentary rocks, which are now elevated as much as 6000 ft above their equivalents in the Sanpete–Sevier valley on the W.

This area has been recently proved to have gas fields of regional importance. One major gas field is being developed at Clear Creek, and significant productive beds appear to have been discovered on the Flat Canyon and Gordon Creek structures, where further development is being carried on or planned.

The producing areas of the plateau are located on a regional uplift, herein named the Monument Peak, which consists of 2 major, NE.–SW. zones of folding. These are considered marginal bands of folding to the adjacent San Rafael swell, an ancient positive element. These flexures represent the culmination of at least 3 periods of movement: middle Upper Cretaceous, late Upper Cretaceous, and post-middle Eocene.

E. N. T.

1402. Pacific northwest tempts wildcatters. F. J. Gardner. *Oil Gas J.*, 13.6.55, **54** (6), 355.—275 wildcats have been drilled in Washington and *ca* 100 in Oregon; all have been unsuccessful, but exploration continues.

The N. Bellingham basin in Washington is being tested to 6000–7000 ft, and in W. Oregon 2 wildcats are being drilled in Lane County and in Clatsop County. Gas has been found recently across the Oregon–Idaho border in the Vale–Ontario basin.

There are oil seeps along the Washington coast, and there are shows at Grays Harbour.

C. A. F.

1403. Parker hits in Canada. F. J. Gardner. *Oil Gas J.*, 20.6.55, **54** (7), 63.—A well recently drilled in the old Stony Creek field in Albert County, New Brunswick, had oil flows in the Albert Mississippian at 2706–2740 ft, 2800–2824 ft, and 2905–2989 ft; 90 ft of net effective pay is expected.

Stony Creek was discovered in 1909 W. of the abandoned Dover field discovered in 1859; 135 wells were drilled, of which 25 produced oil and 86 gas. *Ca* 25 billion cu. ft. gas and 600,000 brl oil have been produced, and approx 54 wells are currently producing gas.

Following extensive seismic and gravity work in the area a few years ago, 4 wildcats were drilled in the vicinity of the field, but all were dry.

C. A. F.

1404. Israel finds gas. Anon. *Oil Gas J.*, 20.6.55, **54** (7), 80.—A test well 20 miles SW. of Petah Tiqva has found gas in Miocene sands below 3018 ft at a pressure estimated at 2000 p.s.i. Shows of gas had also been found at 2526 and 2755 ft with oil indications above 2755 ft.

C. A. F.

1405. Economic study of the search for oil and its profitability in Equatorial Africa. R. Buttin. *Rev. Pétrolière*, 1955, (965), 17.—An account is given of the exploration work carried out since 1946 in the regions of Equatorial Africa, particularly in the French Congo, Cameroons, and Madagascar. The basis for calculating the cost of the different exploration methods, geological and geophysical, is described and illustrated graphically.

The methods of estimating the cost of oil and of the search for oil are explained in detail and are applied to the profitability of the oil search operations in French Equatorial Africa, the Cameroons, and Madagascar. Similar figures, for comparison, are given for the world, the U.S.A., Venezuela, and the Middle East.

From the detailed studies made, estimates are given for the amount of capital which could reasonably be invested in the search for oil in the regions of French Equatorial Africa.

W. W. G.

1406. Oil prospecting in the Brahmaputra valley and the Bengal basin. Anon. *Indian Minerals*, July 1954, **8** (3), 141–4.—A short review of the progress made in the search for petroleum in 2 alluvial areas in NE. India—W. Bengal and Assam. In W. Bengal an aeromagnetic survey has been completed and is going to be followed up by a geophysical survey on the ground. In Assam, an aeromagnetic survey and surveys by other geophysical methods were put in hand at the same time, and the indications of oil revealed by these investigations were finally proved by drilling near the village of Nahorkatiya in Lakhimpur district, where so far 3 wells have been successfully drilled and drilling for the fourth well began in July 1954. The first 2 wells are now producing good quantities of oil, which are being transported to Digboi for refining.

(Author's abstract.)

1407. Short report of the progress of sedimentology in Japan since 1949. T. Sakamoto. *Rev. Inst. franç. Pétrole*, May 1955, **10** (suppl.), 69–72.—A number of papers has appeared on the interrelation between crustal movements and Tertiary sedimentation and igneous activity in the Japanese island arc area. Rhythmic deposition, slumping, and pyroclastics are discussed. Since 1948 the search for oil has been more widespread, taking the form of surface mapping and geophysical investigations. Recent marine deposits are being examined, as well as the submarine volcano of Myojin Reef. Ecological studies have also been made, using diatoms, foraminifera, and molluscs. For foraminifera there is evidence of association with certain masses of water. On the basis of studies of recent lebensspuren, it is hoped that fossil lebensspuren may become useful as indicators of environments of sedimentation.

G. D. H.

1408. Works published in Belgium since 1948 on sedimentology. W. van Leckwijck. *Rev. Inst. franç. Pétrole*, May 1955, **10** (suppl.), 13–21.—The majority of the publications were on Belgium, and many were concerned with the Quaternary, but there were other papers on the Pleistocene, Pliocene, Oligocene, Eocene, Cretaceous, and Palæozoic. The radioactivity of Tertiary clays has been investigated. Washouts, sedimentary rhythms, limestone breccias, and conglomerates have been dealt with. The Belgian Congo and Luxemburg have afforded material for other papers.

G. D. H.

1409. Review of sedimentological publications in Germany since 1949. H. Fuchtbauer. *Rev. Inst. franç. Pétrole*, May 1955, **10** (suppl.), 5–12.—Among the methods described are the use of X-ray quantitative analysis of clays, the theory and use of the phase contrast microscope, and differential thermal analysis. Recent sediments from the Baltic, North Sea, and Atlantic have been investigated. Heavy mineral studies have been made on ancient sediments, and diagenesis and alteration of rocks and minerals have also received attention.

G. D. H.

1410. Progress of sedimentology in Denmark in the period 1949–1954. K. Hansen. *Rev. Inst. franç. Pétrole*, May 1955, **10** (suppl.), 22.—The Eocene diatomaceous earth of the Limfjord area and the bog ore in Jutland have been investigated. There have also been studies of recent sedimentation in the salt marshes and the Wadden sea along the W. coast of Jutland.

G. D. H.

1411. Recent Swedish sedimentological studies. Anon. *Rev. Inst. franç. Pétrole*, May 1955, **10** (suppl.), 52–60.—65 abstracts of Swedish sedimentological studies are given. These include investigations of deep sea deposits, age determinations, size distribution, plasticity, distribution of elements, varve formation, mineral transformations, sampling equipment, differential thermal analyses, climatic changes, formation of manganiferous and ferriferous bog ores, salinity of interstitial waters, flint formation, shallow seismic studies, and many other topics.

G. D. H.

1412. Bibliography of recent French sedimentological publications. A. Vatan. *Rev. Inst. franç. Pétrole*, May 1955, **10** (suppl.), 29–48.—New methods of presenting granulometric data have been proposed, and the shapes of particles, especially pebbles, are being studied. Heavy minerals have received much attention, and in rivers transport has been investigated. Sandstones, particularly those of the flysch, clays, carbonate rocks, bauxites, iron minerals, phosphates, and evaporites have all been the subject of publications. There are 61 regional studies of recent sediments and 34 of ancient sediments. Important investigations have been made on the Rhône delta and the Loire estuary. Among other topics are continental geomorphology and eolian, glacial, and periglacial phenomena, erosion, transport and sedimentation, physico-chemical factors that are involved in diagenesis and metasomatism, biological factors, and climatic influences and

tectonic factors which may affect sedimentation. Finally, sedimentology is of prime importance in petroleum geology. G. D. H.

1413. Principal sedimentological studies, 1948–1954. A. Carozzi. *Rev. Inst. franç. Pétrole*, May 1955, **10** (suppl.), 61–2.—Various papers have been published on the molasse basin, including the description of the bituminous sands of Peissy, calcimetry, cyclic sedimentation, and palæogeographic studies. The tectonic relations and nature of the flysch have been investigated, and evidence of turbidity currents has been given. Statistical studies of minerals and fossils have been applied in investigating the Jurassic and Cretaceous of the Jura and the Helvetic nappes in Switzerland and France, while rhythmic sedimentation has been considered in terms of climatic factors. The precipitation of $CaCO_3$ in Lake Neuchâtel has been investigated, while there has been work on authigenic minerals. G. D. H.

1414. Brief review of Italian sedimentological publications (1948–55). P. Gallitelli. *Rev. Inst. franç. Pétrole*, May 1955, **10** (suppl.), 49–51.—One group of papers is concerned with beds with montmorillonitic, kaolinitic, and illitic clays, and with the conditions of formation and deposition. The decolorizing clays of Calabria and Sardinia, the bauxites of S. Italy, and the deposits with meta-halloisite of Bagnoregio have also been discussed.

The sands of the Tyrrhenian coast have been studied, and a new mineral of the epidote family has been identified from sandstones from the region of Trieste and the Tagliamento valley.

Mineral alterations have been investigated, and clay products derived from diabasic rocks have been described, as well as other transformations. Geochemical studies have been made to determine the minor constituents of clays in arenaceous and argillaceous rocks in the N. Apennines. G. D. H.

1415. The advance of sedimentology in Spain during the past five years. O. Riba. *Rev. Inst. franç. Pétrole*, May 1955, **10** (suppl.), 23–8.—Sedimentary petrography, pedology, and the search for useful rocks are the principal features of the sedimentological publications during recent years. Heavy mineral work has been executed on modern continental deposits, and the Tertiary of the Meseta. The magnesites of the Basque Pyrenees have been studied, and micropalæontological investigations of ancient rocks linked with palæogeography and sedimentology. Various soils have been examined and the process of soil formation considered, while the petrography, properties, and origin of the Spanish bentonites have been investigated. G. D. H.

1416. Summary of the main studies of the petrography of sedimentary rocks in U.S.S.R. J. Poustovalov. *Rev. Inst. franç. Pétrole*, May 1955, **10** (suppl.), 63–8.—The petrography of petroliferous formations has been examined, especially from stratigraphic and correlation points of view, and has generally been associated closely with micro-palæontological work. The Caucasus, Urals, and Russian platform are the regions where this has been done mainly, but there is some work on Siberia. Granulometry as well as mineralogy have been used, in association with measurements of density, porosity, permeability, and magnetism. Various manuals have appeared, some of which relate particularly to clays, and to thermal, X-ray, and electron microscope techniques.

Carbonate rocks have received special attention. Electrodialysis and luminescent analysis have been used in some studies. The source of some of the minerals in the oil-bearing series of the Apsheron peninsula has been determined, and felspars have proved helpful in this connexion. The Maikop and Sarmatian of Georgia have been studied in order to define palæogeographic conditions. The lower Carboniferous of the Volga region and the Devonian of the Ural area have been described by Kolghina and Sokolova, respectively, while Sarkissian has studied the upper Permian and variegated Trias of the Ural area, establishing certain mineralogical associations, and noting changes in passing from one region to another.

In 1952 over 1000 specialists attended a conference in Moscow on sedimentary rocks, and particular consideration was given to petroliferous deposits. G. D. H.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

1417. Geophysics can find more oil for you. N. S. Morrisey. *Oil Gas J.*, 20.6.55, **54** (7), 95.—The role played by geophysics in the work of the exploration geologist is emphasized, and the way in which the geologist uses seismic data is described.

8 geological uses of seismic data are given: staking an edge well, co-ordinating new well control with old seismic data, staking a deep test on a known structure, confirming a subsurface lead, processing a submittal, recommending buying areas, extending known subsurface trends, and mapping sand pinch-outs.

Several hypothetical examples of this co-ordination of data are given. C. A. F.

DRILLING

1418. Exploratory drilling in 1954. F. H. Lahee *et al.* *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 787.—This is the 10th annual report on data gathered by the AAPG committee on statistics of exploratory drilling in the U.S.A. and other N. American territories.

The data are classified and grouped as nearly as possible under one system, and percentages are calculated to present what is probably the most reliable analysis available of the results of exploratory drilling for oil and gas during the preceding year.

During 1954, 13,097 exploratory holes were drilled in the U.S.A., with an average footage of 4549 ft/hole, as compared with the 13,313 exploratory holes with an average depth of 4560 ft in 1953. Analysis of the results of drilling over the last 10 years in the U.S.A. shows that there has been an almost constant success-to-failure ratio of *ca* 11%. It is concluded that only one new field wildcat out of every 44 drilled discovers a field with as much as 1,000,000 brl of total ultimate reserves.

In addition to the introductory paper, a total of 27 other papers presents the results of exploratory drilling in various oil areas of the U.S.A., and there are also papers on W. and E. Canada and Alaska.

In W. Canada, 1368 development wells were drilled in 1954, and a daily average of 263,850 brl of crude oil was produced, with substantial increases in production being achieved in Alberta, Saskatchewan, and Manitoba. In E. Canada, development activities for 1954 were confined to SW. Ontario, where 250 oil wells were completed, compared with 312 in 1953, and oil production amounted to 412,000 brl, an increase of 37% over 1953. E. N. T.

1419. Inclined drilling-principles and application in Yugoslav practice. N. Cizmic. *Nafta (Yugoslavia)*, 1955, **6** (2), 44–60.—Recently in Yugoslavia controlled directional deep well drilling has been initiated. In the first part of the article the principles of controlled directional drilling are laid out. Based on the results obtained with the first directional drilling carried out under the supervision of the author, the analytical as well as graphical representation of the well channel crookedness is treated theoretically. In order to obtain the greatest possible accuracy in stating the actual location of the well channel in the space, the author suggests that through the crooked well channel represented by a double curvature line vertical planes be laid. As the crookedness is measured at predetermined intervals of the channel length, such vertical planes laid through individual parts of the inclined or crooked well channel are considered as wrinkles of a vertical open curtain. The individual wrinkles are further treated as parts of a vertical cyl, thus enabling the author to locate with the aid of suitable projections and with greater accuracy the actual position of the considered channel part in the space.

The results of the theoretical investigation described may be applied practically where exact underground location is essential, for instance in such cases where 2 or more wells are to be carried out in such a way that their distances in some depth are small. (Author's abstract.)

1420. Lignosulphate stabilized emulsions in oil well drilling fluids. W. C. Browning. *J. Petrol. Tech.*, 1955, **7** (6), 9–15.—Investigations indicate that lignosulphates in sol are sub-colloidal, high-mol.-wt. poly-electrolytes, which do not possess hydrophobic–hydrophilic mol structure. Generally they do not lower the surface tension in aq soln, but some sodium cpds in alkaline brines may cause the lowering of interfacial tension. The stabilization of oil-in-water emulsions by lignosulphonates is due to adsorption of these cpds at the interfaces, giving a semi-rigid film and a high order electro-kinetic charge. These emulsions are stable in the presence of high concn of electrolytes, and to heat, freezing, and mechanical action.

As drilling fluids lignosulphate-stabilized emulsions can have low water loss, quite apart from colloidal additions, being also of low visc and wt if required, although the values of the last 2 properties can be raised if needed. Lignosulphates have been successfully used in both brine-base and lime-base muds.

G. D. H.

1421. Israel's oil prospects look better than ever. Anon. *Oil Forum*, 1955, **9** (3), 92.—Israel lies NW. of the Arabian areas, where the large oilfields of the Iraq–Persian Gulf basin are located. The only extensive exploration W. of this area has been in the Sinai peninsula, where 2 discoveries during the year have brought the number of oilfields in the W. Sinai up to 5. The formation in Israel is believed to be comparable geologically with that in Sinai.

During the past year deep tests have been started at widely separate locations in Israel, in addition to the drilling of almost 100 stratigraphic core holes using 5 light portable units. This work has followed surveys made by 5 geological parties and 5 geophysical teams.

Early this year good shows of gas have been obtained from 2 wells drilled near Petah Tiqva, 3½ miles NE. of Tel Aviv. The gas is mainly methane and ethane, with 0·1% or less of propane.

5 deep tests are being drilled—at Mazal, Beeri, Zikhron Yaaqov, Tel Safi, and Rekhme (Sdeh Boqer). W. W. G.

PRODUCTION

1422. Calculation of stabilized gas well performance curves from back-pressure test data. D. Cornell. *J. Petrol. Tech.* 1955, **7** (5), 53–5.—Back-pressure test data on gas wells represent flow under unsteady conditions, with the drainage radius increasing with time. The effects of changes in drainage radius can be calculated, and the results used to prepare stabilized performance curves for fixed values of drainage radius, for definite periods such as 3-, 7-, or 30-day stabilized performance curves. The principle of the method is discussed, and the application is described. The stabilized performance curves are useful in calculating gas well deliverabilities, and in scheduling production from gas fields.

G. D. H.

1423. Performance of water drive reservoirs, including pressure maintenance, as determined by the reservoir analyser. J. M. MacDowall. *J. Petrol. Tech.*, 1955, **7** (5), AIMME Tech. Paper No. 4042, 73–8.—A Carter type of electrical analyser has been used to give the performance of a circular oil accumulation, 100 ft thick and surrounded by an aquifer of 36 miles radius or of *ca* 100 miles radius. Permeability was uniform, and values ranging 100 to 1600 mD were used. Pressure maintenance as well as primary water drive were studied. In total water drive reservoirs the study indicated an initial transient pressure decline, followed by a steady-state straight-line part which is steeper the higher the producing rate, but flat for an infinite aquifer. In tight reservoirs the transient period will be long. A greater total water influx can be obtained from a limited aquifer without pressure maintenance when the producing rates are low at abandonment. The lower the pressure maintained on water injection, the greater the energy received from the natural aquifer. Water injection wells should be as near the oil as is fesible with the maintenance of a uniform flood front. When a fairly large aquifer has a low permeability, *i.e.* 100 mD for the case considered, only a small part will be effective in producing oil at economic rates. G. D. H.

1424. Differences in behaviour of fresh and aged East Texas Woodbine cores. J. G. Richardson, F. M. Perkins, and J. S. Osoba. *J. Petrol. Tech.*, 1955, **7** (6), AIMME Tech. Paper No. 4056, 86–91.—Residual oil saturations greater than expected on some Woodbine cores, which had stood in open containers and been extracted with organic solvents before water-flooding, led to an investigation of the behaviour of "fresh" and "aged" cores. The fresh cores were sealed after cutting, and contained crude oil, connate water, and some filtrate. The aged cores were obtained by extracting the fluids. The fresh cores had higher capillary pressures at given water saturations than the aged cores, using the porous diaphragm technique, and except at the highest saturations, the same was true in centrifuge determinations. The irreducible minimum water saturation was higher for fresh cores after displacement by oil than for aged cores. The residual oil saturation after water-flooding fresh cores was appreciably less than after flooding aged cores.

Imbibition experiments showed that both fresh and aged cores imbibed water spontaneously, but the rate of imbibition was greater for aged than for fresh cores. It is suggested that the differences are due to changes in the solid surfaces of the rock. G. D. H.

1425. Fracturing at high injection rates, Spraberry trend area field. T. P. Brooks, P. C. O'Quinn, and W. E. Life. *J. Petrol. Tech.*, 1955, **7** (5), 14–17.—16 Upper Spraberry wells in the Pembrook–North section have been subjected to fracture treatment using high injection rates. The aim was to keep well-head pressures less than 2000 p.s.i., and this limited the injection rate to 38 brl/minute, with up to 6 pump trucks for 5½-inch casing, and 50–67 brl/minute for 7-inch casing with up to 8 pump trucks. Open holes were more costly to treat than those with perforated casing. 11 wells initially averaged 277 b.d. each and had declined to 27 b.d. average before treatment, while G.O.R.s had risen from 759 to 3779 (average). Immediately after treatment the average producing rate was 216 b.d., and current rates average 68 b.d. (ranging 3–14 months after fracturing). The total cost of treating these wells was *ca* $150,000. The gross value of oil since produced, less that which would have been expected in the same period without fracturing, is $370,000. The trends of G.O.R, formation pressure, and water production are comparable with the trends before treatment. In some cases relatively high water production immediately after fracturing is believed to be due to break-down of water blockage near the well.

G. D. H.

1426. Analysis of pressure fall-off curves obtained in water injection wells to determine injective capacity and formation damage. T. J. Nowak and G. W. Lester. *J. Petrol. Tech.*, 1955, **7** (6), 96–102.—On shutting in a water input well the well-head pressure does not drop immediately, because a residual pressure lingers in the vicinity of the well which is greater than the average reservoir pressure. This phenomenon is analysed theoretically, and the physical limitations in practice of the resultant equations are discussed. The aim is to obtain the static reservoir pressure, the potential water injective capacity of the formation, and the formation damage (skin effect) around the well.

The measurement of pressure fall-off is described, and it is recommended that before making the observations injection should be at a constant rate for at least one week. Several pressure fall-off curves are presented, and a sample analysis and computation are given. It is believed that data obtained

from the analyses may be useful in investigating the benefits which might result from the application of remedial measures.
G. D. H.

1427. Encroachment of injected fluids beyond the normal well pattern. B. H. Caudle, R. A. Erickson, and R. L. Slobod. *J. Petrol. Tech.*, 1955, **7** (5), AIMME Tech. Paper No. 4041, 79–83.—In a secondary recovery project a considerable part of the producing formation often lies between the reservoir boundary and the last row of wells. Hitherto there seems to have been little or no reference to sweep efficiencies in such areas. The X-ray shadowgraph technique has been used to investigate this matter experimentally for a 5-spot pattern in a rectangular area, with the boundary one well-spacing beyond the last row of wells. Miscible phase displacement with mobility ratios of 0·3, 1, 3, and 9 was used, and sweep was continued until the production was 95% injected fluid. For the case examined at least 90% of the area outside the last row of wells was contacted by the injected fluid before abandonment.

In practice the boundaries may be water contacts or thickness pinch-outs.

Data are given which may be used to evaluate the recovery of oil from the edges of a 5-spot injection system.
G. D. H.

1428. Secondary recovery operations in the Tijerina No. 3 unit reservoir. M. A. Olansen. *J. Petrol. Tech.*, 1955, **7** (5), 23–6.—The Tijerina No. 3 reservoir lies 7200 ft subsea in the SW. part of the Tijerina–Canales–Blucher field of Jim Wells County, Texas. It is a lower Oligocene permeability trap on an erratic monocline with an average SE. dip of 170 ft/mile. The sand is fine, medium to hard, and with scattered shale streaks. Porosity ranges 12–32%, and permeability is erratic, ranging 0–300 mD. Interstitial water is estimated at 33%. Daily average production from 10 wells had a peak of 598 brl in May 1948, followed by a sharp decline. Agreement for unitization was reached in December 1949, when the output was 86 b.d. The reservoir was shut in, and gas injection began in May 1950, the average input for 6 months being 1800 M.c.f/day at 2800 p.s.i. Production increased to a peak of 235 b.d. in November 1950. For 18 months the average pressure was fairly stable at 1900–2200 p.s.i., but a pressure gradient developed, and this approached 1500 p.s.i. in June 1952, the structurally low wells having had continuing slow pressure declines, while wells high on structure had pressure rises. Closing in up-structure wells caused fluid movement down structure. In May 1954 injection was adjusted just to balance withdrawals, and well outputs will be adjusted in terms of gas–oil ratios and pressure sinks.

It is believed, on the basis of material balance calculations, that little or no injected gas has gone into soln. Expected primary recovery was 19·3% of oil in place; currently 26·4% has been recovered, and 37·3% is ultimately expected. The project is economically sound.
G. D. H.

1429. Creole studies far-reaching conservation plans. Anon. *Oil Forum*, 1955, **9** (3), 86.—Creole Petroleum Corpn's Tia Juana No. 1 gas conservation plant, by re-pressuring reservoirs, is expected to increase the ultimate oil recovery from the formation by 33% with an immediate increase of 50% and 137 million cu. ft. of gas conserved daily. Owing to the great distance from markets, prior to this plant going into operation, only 23% of the natural gas produced in Venezuela was either used or conserved, the remaining 77% being vented into the air. The new plant, the largest yet built, enables the company to operate more efficient recovery methods with its existing wells on Lake Maracaibo. The No. 1 gas plant is erected on a man-made concrete island standing on piles in the lake and comprises 10 6000-h.p. gas turbines and 10 centrifugal compressors.

The reservoir that is to receive the injected gas covers an area of 9800 acres, and the net thickness of the sand is *ca* 170 ft, the sand itself having a high porosity and excellent permeability. The upper part of the sand is *ca* 5250 ft below the lake level.

The Creole Corpn has plans for the construction of Tia Juana No. 2, a new and larger compressor plant which will also be on Lake Maracaibo, and will inject into a neighbouring reservoir. The new unit will have a capacity of more than double the present No. 1 plant.
W. W. G.

OILFIELD DEVELOPMENT

1430. Good engineering pays off in Slick–Wilcox field. W. H. Rosser. *Oil Gas J.*, 20.6.55, **54** (7), 87.—The geology, development, and operating problems of the Slick–Wilcox field in Goliad and DeWitt counties, Texas, are outlined. The field, discovered in 1943, produces from the Wilcox Massive sand at *ca* 7600 ft, and development of 1920 productive acres on 40-acre spacing was completed by June 1945 with 48 producing wells.

The accumulation is a fault trap, with control provided by closure against the N. and upthrown side of an E.–W. fault.

There is an active water drive, and the rise of the table has been erratic.

The main operating problems were corrosion and salt-water production, and these have now been overcome by controlling corrosion by chemical inhibition and water production by individual recompletions.
C. A. F.

1431. Petroleum in Latin America. J. L. Mathieu. *Rev. Pétrolière*, 1955, (964), 17.—A statistical review is given of the crude oil production in the past, in the countries of Latin America, comparing these figures with the production in other parts of the world. Information is tabulated regarding legislation relating to exploitation by government monopoly and by private enterprise. Details are given of the growth of crude oil production, refinery activities, and exports for each of the countries from the beginning up to the end of 1953, and the influence of local mining legislation on these developments is traced. The countries dealt with are Venezuela, Mexico, Colombia, Argentina, Trinidad, Peru, Brazil, Ecuador, Chile, and Bolivia.
W. W. G.

1432. India's oil potential. S. S. Bhatnagar. *Indian Minerals*, Oct. 1954, **8** (4), 237–42.—The author begins with a description of the origin and nature of occurrence of oil in the earth and goes on to explain that oil exploration in India will be a joint enterprise of the Government and private companies, as it is a highly technical, elaborate, and expensive process. He then gives an account of the prospective oil-bearing areas in India and the progress so far made in the exploration of oil in the Assam Valley and touches on the possibilities of further exploration in W. Bengal, Jaisalmer, and Kutch with the help of modern techniques of oil prospecting.
(Author's abstract.)

TRANSPORT AND STORAGE

1433. Soap and water clean dirty pipelines too. C. McClure. *Oil Gas J.*, 4.7.55, **54** (9), 107.—The use is described of detergent water method of line cleaning by El Paso Natural Gas Co and the history given of previous methods. New style pipes show great improvement over the old ones, and the method raised the efficiency by 22% and made possible a yearly saving of $40,000 on 50 miles of line.
G. A. C.

1434. The new natural gas line in the Rhine–Main area. W. Wessing. *Erdöl u. Kohle*, 1954, **7** (12), 836–8.—The natural gas from the Pfungstadt field contains 97% methane compared with the usual 80–90% methane content of German and European natural gas. It is, therefore, eminently suitable for use as a chemical raw material.

A pipeline has been constructed, 40·5 km long and 100 mm

internal dia, to deliver the gas from Pfungstadt to Höchst at the works of Farbwerke Höchst AG, where the gas is used as a raw material for the manufacture of chemicals.

A description is given of the construction of the pipeline, which was brought into operation at the beginning of June 1954. W. W. G.

1435. Hold that pipeline. H. C. van der Heyden and E. A. Wallace. *Oil Gas J.*, 11.7.55, **54** (10), 109.—Case histories are given for 2 30-inch gas-transmission lines in the desert west of Blythe, California, where main line anchors were installed to combat movement caused by increased operating pressures and temp following the addition of 2 booster stations which had resulted in failure of a 12-inch connexion. G. A. C.

1436. Ill effects of electrification of gasoline. L. Brüninghaus. *Rev. Pétrolière*, 1955, (966), 33.—Experiments are described illustrating the accumulation of a negative charge of electricity in gasoline when pumped through the pipelines into storage tanks. In order to obviate the danger of fires caused by the discharge of these accumulated electric charges, it is recommended that all pipelines and tanks are well earthed. A description is given of a metal float immersed in the surface of the gasoline to which is attached a cable passing over a pulley in the roof of the tank and connected to a steel spring attached to the outside shell near the bottom of the tank. This arrangement serves to discharge continuously the negative static charge on the gasoline when pumped into the tank. W. W. G.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

1437. World's most spectacular refinery. B. Orchard Lisle. *Oil Forum*, 1955, **9** (3), 83.—A widespread use of colour in the various storage tanks gives a pleasing effect in the latest addition of lub oil and paraffin wax plants at the Salamanca refinery of Petroleos Mexicanos (Pemex). The new lub oil plant consists of a vacuum dist unit having input capacity of 15,000 b.s.d. of residuum, a propane de-asphalting unit, a furfural solvent extraction unit, and a MEK–toluene unit for wax extraction. The production of lubricants from this plant, 2500 b.d., is sufficient for the total present needs of the Mexican Republic. W. W. G.

1438. Welding widely used in construction of oil refinery plant, equipment, and pipes. Anon. *Chem. Engng. Min. Rev.*, 1955, **47** (5), 171.—Pressure vessels, tanks, and pipelines at 4 Australian refineries are being constructed by welding to a much larger extent than ever before. The refineries concerned are at Kwinana, W. Australia; Kurnell, N.S.W.; Geelong, Victoria; Altona, Victoria.

The radiograph method is extensively used for testing the welding of seams of the pressure vessels. To cope with the large amount of welding of vertical and horizontal seams of the storage tanks, automatic welding is widely applied. Extensive use is also being made of the welding of pipelines, the application of the pantograph for cutting pipe being largely instrumental in speeding up pipe-fitting operations. W. W. G.

1439. What Plantation learned in 2 years of operating unattended pump stations. T. V. Bockman and R. S. Cannon. *Oil Gas J.*, 27.6.55, **54** (8), 87.—Based on 2 years' experience, it is recommended that the stations should be designed for max safety, employing the best available equipment, and electrical and mechanical maintenance should be co-ordinated. G. A. C.

DISTILLATION

1440. Fractional distillation. H. H. M. Jones. *Chem. Proc. Eng.*, 1955, **36**, 291–5.—Literature review under the heads of: calculations, bubble caps, packed columns, perforated plates, batch dist, extractive and azeotropic dist, lab applications, etc. 103 refs. V. B.

SOLVENT EXTRACTION AND DEWAXING

1441. Hydrocarbon separation by liquid–liquid extraction with benzyl alcohol. J. Durandet, Y. L. Gladel, and F. Graziani. *Rev. Inst. franç. Pétrole*, 1955, **10**, 585–94.—Liq–liq equilibrium determined for benzyl alc (**I**)/*n*-heptane/*cyclo*hexane at 0° and 15° C and for **I**/*n*-heptane/toluene at 0° C, also CST of **I** with *n*-paraffins (C_{11}–C_{17}). CST rises with increase mol. wt. of *n*-paraffin. **I** has fair selectivity for separation of aromatics from paraffins, but yield is limited by poor max aromatic concn attainable; for separation of naphthenes from paraffins **I** has poor selectivity. Findings of Francis (*Industr. Engng Chem.*, 1944, **36**, 764, 1096) that **I** has better selectivity than aniline could not be confirmed. V. B.

CRACKING

1442. Cat reforming with in-place regeneration. W. H. Decker and D. Stewart. *Oil Gas J.*, 4.7.55, **54** (9), 80.—The use of the Sinclair–Baker RD-150 cat in the cat reformer at the Sinclair Marcus Hook refinery has given excellent reforming characteristics, and coupled with the easy and rapid regenerability of the cat allows the maintenance of near virgin activities throughout the life of the cat change. Tables show comparative operating conditions. G. A. C.

1443. Electronic control of a Catformer unit. F. C. Somers and R. C. Fuhs. *Oil Gas J.*, 27.6.55, **54** (8), 82.—The design and operation of Atlantic Refining Co's 8000-b.d. electronically controlled Catformer is described. Equipment problems, operating advantages, and maintenance procedures are discussed. G. A. C.

CHEMICAL AND PHYSICAL REFINING

1444. Hydrodesulphurization plant at Stanlow refinery. Anon. *Engineer, Lond.*, 1955, **199**, 843–4.—First commercial hydrodesulphurizer came on stream in April 1955, processing light cat cracked cycle oil at 5000–7000 b.s.d. over cobalt–molybdenum alumina cat using "trickle" technique. H_2 from outside source compressed and joined by H_2-rich recycle gas, mixed with 80% of charge oil and preheated before entering reactor. Remaining 20% of cold feed injected into reactor to control temp rise. Reactor products fractionated into 5% 100 O.N. aromatic gasoline, 25% 200°–260° C fraction, 70% 260° C + fraction having 0·3% S, *i.e.* 90% total S removal. H_2S from gas stream removed by diethanolamine scrubbing and converted to S in Claus kiln. Photograph and flowsheet. A. C.

METERING AND CONTROL

1445. Mixing equipment for viscous liquids. B. von Hahn. *Erdöl u. Kohle*, 1954, **7** (12), 830–2.—Various types of meters are described, suitable for measuring visc liq which are pumped together for producing blends. Details are also given of regulators which control the vol of liq passing through pipelines to a constant desired rate so that blends of constant composition are continuously produced. W. W. G.

PRODUCTS

CHEMISTRY AND PHYSICS

1446. Applied chemical kinetics. XII. Enzyme catalysis. J. C. Jungers and M. Hellin. *Rev. Inst. franç. Pétrole*, 1955, **10**, 595–635, 755–85 (*cf.* Abs. **967**, 1955).—Analysis of enzyme action; kinetics of enzyme action; study of diastase; kinetics of bacterial growth; applications. V. B.

1447. Bar viscometer. D. Tollenaar and M. C. Bisschop. *J. Colloid Sci.*, 1955, **10**, 151–7.—This instrument is suitable for measurements at shearing stresses of 10^4–10^6 dynes/cm^2, beyond that attainable in the ordinary rotational viscometer. It comprises a polished cyl of accurately known dia suspended within a ring of slightly larger dia. The liq is placed between the 2 parts, and the cyl is allowed to fall at a controlled rate by means of a counter balance. The rate of fall at constant load can be adjusted by using rings of different dia, thus altering the clearance between them and the bar. The instrument is calibrated by using oils of known visc. H. C. E.

ANALYSIS AND TESTING

1448. A new activated carbon extractor. O. Hahn. *Erdöl u. Kohle*, 1954, **7** (12), 829–30.—A description of an apparatus designed to heat up containers of activated carbon which have been used to adsorb hydrocarbons in connexion with gas analysis and hydrocarbon extraction. The equipment, which is all-electric and is arranged very compactly, can also be conveniently used for the steam dist of crude oils. W. W. G.

1449. Estimation of elemental sulphur in benzine by the Sommer test. I. Comments on the recent report by A. Albert. G. E. Mapstone. *Erdöl u. Kohle*, 1954, **7** (12), 826–9.—In a communication by Albert (*Erdöl u. Kohle*, 1954, **7**, 289) on quantitative tests for the estimation of sulphur in benzines, he reports that some of his results do not agree with Mapstone's findings (*Industr. Engng Chem. Anal.*, 1946, **18**, 498) on modifications in the Sommer test (*Industr. Engng Chem. Anal.*, 1940, **12**, 368). In this article Mapstone explains that contrary to the views of Albert, the test was developed for the estimation of excess elemental sulphur in plumbite-treated benzines which normally contain 50–55% olefins and has since been used with success.

II. Reply to the comments of G. E. Mapstone. A. Albert. It is possible that benzines of various sources may give different results in colour reactions with the pyridine–alkali reagent. The researches of Albert in 1949 were carried out on benzines of Middle East origin. W. W. G.

1450. Determination of colour of petroleum products. H. M. Hancock and J. J. Watt. *Bull. Amer. Soc. Test. Mat.*, Oct. 1954, (201), 31–6.—The Saybolt Chromometer method and the Union Colorimeter method of measuring the colour of petroleum products are described in detail with brief notes on the Tag–Robinson Colorimeter and the Lovibond Tintometer. The development of photo-electric methods is discussed, and an account is presented of the attempts to bring the Union Colorimeter method into line with modern requirements culminating in the preparation of the Hellige standards. J. G. H.

1451. Accelerated method to determine mean Hertz loads for E.P. oils. A. Girelli, C. Paleari, and C. Siniramed. *Sci. Lubric.*, 1954, **6** (11), 27–9.—Wear load diagrams obtained by the testing of lubricants on the 4-ball testing machine show 3-branched lines, the first representing the behaviour of wear under different applied loads in the absence of seizure, the second, the zone of incipient seizure, and the third, behaviour under applied loads higher than the instant seizure load. A procedure is presented whereby the runs representing the first branch are eliminated, their results being replaced by a "compensation line," deduced from tests carried out with standard oils. J. G. H.

1452. Small-scale laboratory evaluation tests on synthetic lubricants. F. G. Watson. *Lubric. Engng*, March–April 1955, **11** (2), 86–90.—The desirability of there being available small-scale tests, which materially duplicate the results of full-scale tests, for the evaluation of lab preparations of synthetic lubricants is stressed, and details of equipment and procedures developed for the testing in this manner of organophosphorous compounds, diesters, silicates, silicones, and polyglycols are outlined. Tests covered include fl. pt., pipe cleaner flammability test, oxidn corrosion, and thermal stability. Satisfactory correlation with full-scale tests was obtained in every case where such tests were available. J. G. H.

1453. Analytical procedure for the determination of refining distillate lubricating fractions. G. Costantinides and G. Arich. *Riv. Combust.*, 1955, **9** (6), 559–68.—I.r. absorption data, obtained in order to control the silica gel adsorption, and determination of solubility in furfural, with the aim of establishing a comparison between solvent extraction and selective adsorption, confirm the interest of the procedure adopted and its validity. (Authors' abstract.)

1454. Cone and plate viscometer. H. Markovitz, L. J. Elyash, F. J. Padden, and T. W. DeWitt. *J. Colloid Sci.*, 1955, **10**, 165–73.—In this instrument the liq is sheared in the gap between a stationary truncated cone and a rotating flat plate. A known torque is applied to the plate, and the resulting angular velocity is observed and measured by means of a light beam reflected from a mirror mounted on the shaft. Cones of ½°, 2°, and 4° base angle were used, and the tips were made flat in accordance with theoretical and experimental justifications which are fully discussed. The instrument is maintained at constant temp by means of a water bath.

Liq with visc from 1 to 50,000 O have been investigated using rates of shear varying from 0·0002 to 9000 sec^{-1}. Results for typical Newtonian and non-Newtonian liq are given. H. C. E.

1455. Some new approaches to the measurement and prediction of the apparent viscosity of lubricating greases. J. L. Dreher, C. F. Carter, and E. B. Reid. *Inst. Spokesm., nat. Lubric. Gr. Inst.*, Jan. 1955, **XVIII**, (10), 8–12.—While in recent years the significance of apparent visc as a means of characterizing the flow properties of greases has become generally appreciated, standardization of apparatus and procedure for its measurement has not developed at a corresponding rate. Details are here presented of the apparatus and procedure evolved at California Research Corpn for this purpose and the relationship between apparent visc of a lubricating grease prepared with a given type of thickener and the visc of the mineral oil used; the concn of the thickener and the consistency of the grease are discussed, and a correlation so developed is presented. J. G. H.

1456. Humidity control for rocket-fuel testing. F. M. Thomas. *Oil Gas J.*, 11.7.55, **54** (10), 130.—A chemical-type dehumidification system is described, used by Phillips Petroleum Co in its Bartlesville lab to maintain desired conditions for developing and testing certain rocket fuels. G. A. C.

1457. Flash calculations as performed on the I.B.M. Card Programmed Calculator. E. J. Organick and H. J. Meyer. *J. Petrol. Tech.*, 1955, **7** (5), 9–13.—Flash calculations are of fundamental importance in the oil industry, and are most tedious to perform. High-speed computing machines have been employed for making these calculations, and one of the machines available is the I.B.M. Card Programmed Calculator. The machine prints a composite, compact, and accurate record of the whole calculation, using one of 2 procedures for the calculation. One procedure is used primarily for separator calculations, and in 4 minutes will give optimum pressures and temp in single and in series staging of well effluent of up to 11 components. For reservoir flash calculations at high

pressures, or for process calculations at very low temp the computation takes 7 minutes for up to 20 components. At very low temp equilibrium constants vary significantly with the composition of the feed. G. D. H.

GAS

1458. Conditions for the formation of natural gas hydrates. R. Fagegaltier. *Rev. Inst. franç. Pétrole*, 1955, **10**, 751–4.—Description (with sketch) of apparatus, incorporating a 150-ml glass-walled test cell withstanding 150 kg/cm², and the procedure employed. Experiments were carried out at const pressure and varying temp. Small pressure drop was noticed when hydrate formed. Results are given for stripped St Marcet gas (H_2S 0, CO_2 0·1, N_2 2·9, CH_4 92·3, C_3 4·2, C_3 0·5, C_4 trace, C_{5+} 0). For pressures 27·6–140 kg/cm² temp of hydrate formation is 7·2°–18·6° C. Comparison of experimental results with those calc from data of Katz (*cf.* Abs. **1425**, 1944) shows significant divergence. V. B.

ENGINE FUELS

1459. Automobiles and petroleum, past, present, and future. J. J. Broeze. *Engng J., Montreal*, 1955, **38** (4), 442.—The results of the close co-operation between the automobile and petroleum industries over the last 50 years are described, attention being drawn to the petroleum origin, not only of the fuel used, but also of part of the plastics, lacquers, and plasticizers used in the bodies and also of the carbon black incorporated in the tyres.

The development of the gasoline engine is traced, particularly with regard to the use of fuels of increasing anti-knock value to give more efficient engine operation. The improved quality of gasoline is made possible by modern refinery processes such as cat cracking and hydroforming. The increasing use of motor cars in everyday life, giving rise to severe cyl wear due to corrosion, has been met by the manufacture of improved lub oils, the product of solvent refining processes, and the use of additives.

The future development of the automobile will probably be on the lines of increased efficiency by using higher anti-knock fuels which can be produced by the oil industry. A possible development is in the use of fuel injection combined with carburettor feed so that the max efficiency can be obtained under all operating conditions.

The application of diesel engines to road vehicles is expected to develop from use in heavy-weight to lighter commercial vehicles. The gradual lowering of the sulphur content of fuels for these engines, made possible by improved refining processes, will help to increase this tendency. Although this change-over will apply to some extent to automobiles, it will not affect the bulk of the small-mileage passenger and delivery cars, as the difference in cost of the 2 types of vehicles will persist. W. W. G.

1460. Octane ratings of motor gasolines in Yugoslavia. D. Krpan. *Nafta (Yugoslavia)*, 1955, **6** (2), 39–44.—In this paper the causes and consequences of detonating combustion with respect to the durability of different motor elements as well as of the importance of sufficiently high octane ratings of motor gasolines are offered. The suggested detonation index for each motor type would give the possibility of orientation in the selection of gasoline types for each of the numerous motor types now in use in Yugoslavia and other countries. An approx survey of motor cars in the National Republic of Croatia in 1955 by age, number, and C.R. is tabulated. Extracts from the letters of several car producers show their viewpoints on the minimum gasoline octane ratings to be selected for use in their engines. Finally a diagram showing the minima of research O.N. for a certain percentage of the total number of vehicles in use in Yugoslavia in 1955 is added. From this diagram, for instance, the conclusion may be drawn that of the total requirements *ca* 80% are covered with a 74 C.F.R. motor method gasoline. (Author's abstract.)

1461. Application of statistical studies of combustion in engines to control tests. B. Salé and E. Perthuis. *Rev. Inst. franç. Pétrole*, 1955, **10**, 805–10.—Apparatus for determining average combustion picture over large number of engine cycles. Layout of electrical pressure measuring equipment is shown and also of apparatus, based on ionization, for measuring instant of flame passage past a given point in combustion chamber. For rapid check of effect of a variable on combustion, ionization test will give preliminary information in 1 hr; if results warrant, complete analysis of combustion process by pressure method can then be done in 2–3 days. Tests can be performed on slightly modified standard type engines. V. B.

1462. Invalid induction period. W. R. Power. *Bull. Amer. Soc. Test. Mat.*, Sept. 1954, (200), 56–61.—Attention is directed to the limitations of ASTM D 525 as a method for predicting gasoline stability, and field and lab data are presented as indicative of the inadvisability of placing too much reliance on the method. J. G. H.

1463. Relation between net heat of combustion and aniline-gravity product of aircraft fuels. R. S. Jessup and J. A. Cogliano. *Bull. Amer. Soc. Test. Mat.*, Oct. 1954, (201), 55–61.—Details are presented of an investigation undertaken in order to determine the feasibility of extending to JP-4 and JP-5 fuels the relations between net heat of combustion and aniline-gravity product previously found to hold for AN-F-28 and AN-F-58 aircraft fuels. 36 fuel samples, selected so as to cover as wide as possible a range of properties likely to be significantly related to heat of combustion, were tested by accepted methods. Results so obtained indicate that it is not possible to represent accurately the net heat of combustion of hydrocarbon fuels in general by a single function of aniline-gravity product. 18 refs. J. G. H.

1464. Correlation of induction tests with motor fuel stability. R. W. Donahue. *Bull. Amer. Soc. Test. Mat.*, Sept. 1954, (200), 61–3.—Concern is expressed at the assertion that the induction period test for gasoline stability is inadequate and misleading. Examination of the data on which the assertion was made leads to the conclusion that gum is formed from a variety of reactions and mechanisms, of which the induction test measures some. While it is felt that several different tests may be required to predict adequately storage stability of all types of fuel, it is suggested that the induction test, properly applied and interpreted, is a useful means of measuring the stability of motor fuels. J. G. H.

GAS OIL AND FUEL OIL

1465. Apparatus for the microphotographic study of the atomization of liquid fuels. N. Manson, S. K. Banerjea, and R. Eddi. *Rev. Inst. franç. Pétrole*, 1955, **10**, 636–56.—Theory of method discussed, and how various difficulties encountered overcome. Lay-out of equipment is shown, magnification is 30, and area covered is 9·7 mm², spark illumination is used. Resolving power of apparatus is 10–15 μ. Preliminary results, obtained with kerosine-fed injector from turbo-jet and with injector feeding into container at variable pressure and supplied with either kerosine or gas oil, are described and photographs reproduced. Kerosine gives smaller average droplet size than gas oil, average droplet size increases with increasing pressure. All tests so far with non-burning jets, but study of actual combustion is planned. V. B.

LUBRICANTS

1466. Recent advances in the lubrication field. B. B. Farrington. *Lubric. Engng*, Jan.–Feb. 1955, **11** (1), 17–21.—Applications of chemistry in the field of lubrication during the past 10 years are reviewed. Topics covered include mol. vol. of hydrocarbons, effect of refining processes on visc, use of the electron microscope in structure elucidation, problems

associated with fretting corrosion, and the use of solid and synthetic lubricants. 33 refs. J. G. H.

1467. Methods of research and mechanical applications used by Socony-Vacuum. R. B. Killingsworth, C. W. Nichols, and J. F. Socolofsky. *Sci. Lubric.*, 1954, **6** (12), 10–18.—Test methods used by Socony-Vacuum are surveyed. Engine tests of motor oils are discussed from the standpoints of cyclic test procedures, combustion chamber deposit tests, and engine wear tests. Gear lubricant testing is considered with relation to high and low speed tests and high stability, and details are presented of a special cone worm gear test unit. Screening and performance tests employed for industrial oils are described, together with the Socony-Vacuum hydraulic oil test rig. Wheel bearing and ball bearing tests for greases are described, together with investigations of behaviour in dispensing equipment. J. G. H.

1468. Lubrication problems in road transport. S. E. Holmes and H. M. White. *Sci. Lubric.*, 1955, **7** (3), 14–20, 43.—Summary of paper presented at Institute of Petroleum Summer Meeting 1954. Lubrication requirements are assessed from the standpoints of type of engine, speed, C.R., oil consumption, and bearing materials, with a note of the special problems associated with 2-stroke petrol engines. The effect of leaded and high sulphur fuels is discussed, together with the special requirements of modern transmission systems. Specification details of current crankcase and gear lubricants are presented, and the extent to which these fully meet current requirements is discussed at length. While recent developments incorporating full scale engine and axle-rig tests in specifications constitute real progress, the difficulty of covering varying operating conditions in a written specification remains. J. G. H.

1469. Vacuum Oil Company's new grease plant. *Sci. Lubric.*, 1955, **7** (3), 23–7.—Vacuum Oil Co's new grease plant at Birkenhead, manufacturing more than 200 grades of grease with an annual production capacity of 10,000 tons, is described and illustrated. J. G. H.

1470. Recent developments in test methods for lubricants for small two-stroke engines. R. Laval and M. Flamand. *Rev. Inst. franç. Pétrole*, 1955, **10**, 657–64.—Small (< 125 ml) 2-stroke engines are increasing in importance in Europe, and engine test procedures for lubricants have been developed at IFP and in an English lab. Details of such procedures (50-ml engines) are described, both continuous bench tests and also cyclic tests to simulate actual operating conditions. Each lab also carried out road tests. Main problems of small 2-stroke lubrication are exhaust port fouling, crankcase corrosion, and plug bridging; first of these is main criterion for oil assessment. Reproducibility of the various methods is promising and merits further development of tests, *e.g.* by introducing control of crankcase temp, etc. V. B.

1471. Rationalization of oil purchase; some aspects of cutting oil surveys. H. A. Snow. *Sci. Lubric.*, 1955, **7** (4), 14–17—The importance of correct lubrication of modern production plant is emphasized, and the value of a lubrication survey in reducing to an effective minimum the number of grades of oil carried is discussed. General lubrication requirements for machine tools, oils, and coolants for chip forming cutting equipment, for chipless forming, deep drawing, and other metal working operations are enumerated, together with the functions and selection of rust preventives, water displacing fluids, and quenching and tempering oils. Points are presented on the preparation and implementation of the survey, and some of the problems encountered in centralized buying are indicated. J. G. H.

1472. Calculations on plain bearings. L. Leloup. *Sci. Lubric.*, 1955, **7** (3), 29–36; **7** (4), 20–5.—A method is presented for the determination of the coeff of friction and the operative temp of bearings. The 3 basic principles, that of variation of the coeff of friction, the critical point, and the dissipation of heat produced in plain bearings are discussed in detail on the basis of theoretical data, and experimental results obtained in investigations at the University of Liége and previous work are critically reviewed. It is claimed that the values obtained in this manner enable temp encountered and lubricant requirements to be accurately calculated. J. G. H.

1473. Interpreting ball bearing damage. B. J. Dempsey. *Lubric. Engng*, March–April 1955, **11** (2), 91–5.—Types of damage sustained by ball-bearing installations subjected to improper mounting, loose shaft fitting, misalignment, false Brinelling, stray electric currents, presence of dirt and other abrasives, and lack of lubrication are described and illustrated. Operation and installation of a noise-testing machine is described, and the significance of the various types of noises produced is indicated. J. G. H.

1474. The structure of lubricating greases under the light microscope in relation to their performance. J. F. Hutton, J. B. Matthews, and N. A. Scarlett. *J. Inst. Petrol.*, May 1955, **41** (377), 163.—Lithium and sodium soap greases were examined microscopically in ordinary and polarized transmitted light at linear magnifications varying from 75 to 650 dia. The paper gives the results of these examinations, and shows how the structures revealed can be related to the macroscopic texture of the greases, to storage hardening, and to their performance in ball-bearings. It is concluded that this type of examination can be useful in controlling the quality of greases in their manufacture.

11 literature refs are included. U. M.

1475. Some viscosity–shear characteristics of lubricants. E. E. Klaus and M. R. Fenske. *Lubric. Engng*, March–April 1955, **11** (2), 101–8.—It is generally known that polymer-thickened hydraulic and lub oils undergo a loss in visc when subjected to high rates of shear as in throttling valves, piston clearances, and bearings, such loss being either temporary or permanent, depending on the polymer incorporated and the duration and severity of the shearing experienced. Details are reported of an investigation of this problem carried out at Pennsylvania State College wherein variations in type of polymer used, type of base stock, and type of shearing action produced by differing designs of hydraulic pumps were studied, and applications to the formulation of more effective oils are indicated. J. G. H.

1476. Testing of lubricants for lubricity by means of the Wieland and 4-ball apparatus. I. M. Brunner and R. Pedrini. *Schweiz. Arch. angew. Wiss.*, 1955, **21**, 169–78.—Apparatus of this type can give a rapid answer as to whether sample has E.P. properties or not. Description (illustrated) of Wieland (modified Almen) machine. Results (curves of friction resistance *v.* load) for numerous motor and E.P. oils. In general, results with these machines agree with practice. Additives tested include: castor oil, tricresyl-phosphate, Elektrion-R, Lubrizol 360,917,963; figures are also given for silicone oils (very low lubricity) and multi-grade motor oils containing additives to diminish wear on hydraulic valve gear. Motor oils after considerable use can show improved E.P. properties due to Pb cpds resulting from leaded fuels. V. B.

1477. Measured oil film pressure distribution in misaligned plain bearings. F. W. Oevirk. *Lubric. Engng*, Sept.–Oct. 1954, 10 (5), 262–5.—Details are presented of an investigation set up at Cornell University under N.A.C.A. auspices of the misalignment characteristics of plain bearings, the initial step being the measurement of pressures in the bearing oil film in order to determine the nature of the pressure distribution. Superfinished steel shafts and bronze bearings were used with 1120 aviation oil and oil film pressure distribution was illustrated by plaster models. J. G. H.

1478. Synthetic aircraft greases. H. Schwenker, J. A. King, and J. C. Mosteller. *Lubric. Engng*, Sept.–Oct. 1954, **10** (5), 266–71.—Developments in jet aircraft have resulted in demands for lubricants with an effective temp range of −65° to 450° F. Details are presented of the development and properties of arylurea–silicone oil greases and of progress in

the use of Bentone 34 and lithium hydrostearate as thickening agents. J. G. H.

1479. Mixed friction conditions in lubrication. D. D. Fuller. *Lubric. Engng*, Sept.–Oct. 1954, **10** (5), 256–61.—Bearings subject to extreme conditions of operation result in there being in operation within certain zones a combination of fluid and boundary friction. Earlier work on this phenomena of mixed lubrication is discussed, and a detailed account is given of the work of Altrogge on a journal bearing testing installation using a nut-cracker arrangement on 2 half-bearings fitted with a piezo-electric pressure pick-up. The system was so arranged that the resulting electric changes were transmitted through a mercury contact and shielded cable to either a voltmeter or, for high speeds, an oscilloscope. J. G. H.

1480. Lubrication at a board mill in South Africa. R. W. Tong. *Sci. Lubric.*, 1954, **6** (11), 22–6.—Operations, machinery used, and lubrication organization at the Umgeni mill is briefly described, and the special procedure used for the lubrication of bearings, gears, hydrapulpers, and hydrafiners is indicated. Lubricants storage and colour coding are also discussed. J. G. H.

1481. Reclamation of used oils. 2. E. G. Ellis. *Sci. Lubric.*, 1954, **6** (11), 14–19, 26.—Classification and filtration as methods of oil purification are discussed, and design and operation of filter presses are considered in some detail. The composition and special properties of filter earths are also explained. J. G. H.

1482. Hydrodynamic lubrication of a cam and a cam follower. R. Davies. *Lubric. Engng*, 1955, **11** (1), 37–9.—Valve-lifting cams in an I.C. engine present special difficulties in the way of lubrication because conditions do not lend themselves to the formation of a lubricant wedge. Mathematical equations are derived for minimum oil thickness and max oil pressure between cam and follower, and illustrative calculations are presented. J. G. H.

1483. Radiant heating of lubricant oil. R. H. Johnson. *Lubric. Engng*, 1955, **11** (1), 35–6.—Details are presented of an installation serving to provide lub oil to the bearings of a large wind tunnel compressor at a temp of 100° F, special difficulties being encountered owing to the necessity of the heater surface temp not exceeding 160° F in order to avoid damage to the oil. Heaters selected were heat-resistant type glass panels coated with a high resistance film and mounted on suitable insulators. J. G. H.

1484. Engine bearing design today. J. B. Bidwell. *Lubric. Engng*, Sept.–Oct. 1954, **10** (5), 272–81.—The significance of bearing design in general engine design is discussed, and the importance of bearing details in efficient operation is stressed. Special features considered include oil holes and grooves, oil supply, clearance, dynamic oil films, bearing fatigue, corrosion problems created by lubricant additives, and bearing and shaft wear. J. G. H.

1485. Estersils—a new class of thickening agents. G. C. Meyer and R. O. Braendle. *Inst. Spokesm., nat. Lubric. Gr. Inst.*, Dec. 1954, **XVIII** (9), 8–16; Jan. 1955, **XVIII** (10), 16–18.—Estersils, finely divided siliceous solids reacted with primary or secondary alcohols, have proved of value as thickening agents for lubricating greases because the ester coating provides exceptional resistance to separation of the thickener in the presence of water. Data are presented of the investigations leading to the preparation of the preferred estersil grease thickener, and the preparation and properties of greases containing the new thickener are discussed in some detail. J. G. H.

1486. Simple demonstration of flow type in greases. H. E. Mahncke and W. Tabor. *Lubric. Engng*, Jan.–Feb. 1955, **11** (1), 22–8.—Earlier work on the rheological properties of greases is briefly reviewed. The advantages accruing from a study of velocity distribution are outlined, and the procedure and equipment used in a study of the radial velocity distribution of a grease flowing through a tube with a circular cross-section are described in detail as a first step in a detailed investigation of the relation of structure to rheological properties. J. G. H.

1487. Friction and fretting with solid film lubricants. E. E. Weismantel. *Lubric. Engng*, March–April 1955, **11** (2), 97–100.—Details are presented of an investigation by Aviation Gas Turbine Division of Westinghouse Electric of the effect of such dry film lubricants as molybdenum disulphide and colloidal graphite on fretting and general frictional phenomena. The equipment and procedure employed are described and illustrated, a special feature being the bonding in certain cases of the solid lubricant with various resins. While under static conditions the unbonded solid lubricants proved equally effective in preventing the start of fretting, when conditions such as the presence of air currents or high centrifugal forces were present, tending to remove the lubricant, resin-bonded formulations proved most effective. The desirability of the fullest information on the type of operating environment in order to select the most suitable lubricant combination is stressed. J. G. H.

1488. Recommended practices for lubricating automotive front wheel bearings. Anon. *Inst. Spokesm., nat. Lubric. Gr. Inst.*, Nov. 1954, **XVIII**, (8), 1–15.—A pictorial manual with explanatory notes. Covers disassembly, cleaning, inspection, lubrication, reassembly, adjusting, completion of reassembly, and wheels with disk brakes. J. G. H.

1489. Foaming of a heavy-duty lubricating oil. W. M. Pugh and L. M. Tichvinsky. *Lubric. Engng*, Jan.–Feb. 1955, **11** (1), 29–34.—The significance of foaming characteristics of lub oils is noted, and the efficiency of silicones as foam suppressing agents is discussed. The theory of foam formation and inhibition is considered, and the CRC bubbling test is described and illustrated in some detail; suggestions are put forward for its improvement. J. G. H.

1490. Reclamation of used oils. 3. Centrifugal purification. E. G. Ellis. *Sci. Lubric.*, 1954, **6** (12), 19–25.—Basic principles of centrifuging are summarized, stages in the evolution of the modern centrifuge outlined, and typical modern installations described and illustrated. Special treatment accorded to diesel engine crankcase oils and to detergent oils is outlined, and details of purifier capacity presented. J. G. H.

1491. Reclamation of used oils. 4. Insulating oils: crankcase oils. E. G. Ellis. *Sci. Lubric.*, 1955, **7** (1), 12–17.—Characteristics of electrical insulating oils are indicated, dangers of water contamination are stressed, and methods of removal of dissolved water are discussed with particular reference to the use of high vacuum equipment. Batch treatment of used oils is considered, and the use of activated clays is described in some detail. The reclamation plant of the Canadian Pacific Railway for the treatment of diesel locomotive crankcase oils is described, and data are presented on a fuller's earth acid treating plant, and the Lubex installation is briefly described and illustrated, with tabular data on cleaned oil standards and costs. J. G. H.

1492. New dry bearings have unique anti-frictional properties. Anon. *Sci. Lubric.*, 1955, **7** (4), 35.—Details are presented of the new Glacier Dry Bearings in which polytetrafluorethylene (PFTE) is incorporated into a strong porous metal matrix, producing a bearing combining the strength, heat conductivity, temp, and size stability of the matrix, with the special frictional and chemical properties of PFTE. Typical examples of test data are recorded and special limitations indicated. J. G. H.

1493. Measurement of effectiveness of cutting oils. F. Eugene. *Sci. Lubric.*, 1955, **7** (1), 24–9.—Details are presented of an investigation of the behaviour of lubricants in cutting operations, the basic theory being that this study can best be carried out by measurement of the specific abrasion of the tools. The equipment and procedure employed is described in detail, and the influence of the lubricant on temp of the cut, on the

wear resistance of the tools, and on the specific work of cutting is described. J. G. H.

1494. Bearing temperature control provides automatic emergency engine shut down. S. Bates. *Sci. Lubric.*, 1955, **7** (4), 18–19.—Details are presented of a method of installing Thermistors (metallic resisters) to shut down low-speed horizontal engines when lubrication failure results in dry running of the bearings. The Thermistor is embedded in the bearing shell; when heating occurs a relay is operated which closes a valve in the fuel line and so shuts down the engine before damage can occur. J. G. H.

1495. Biological oxidation of soluble oil emulsions. H. Pivnick, M. Fuller, H. Graham, and S. Uyeno. *Lubric. Engng*, March–April 1955, **11** (2), 96.—The Warburg apparatus used by biochemists for the study of tissue metabolism is briefly described, and its application to the rapid determination of the susceptibility of soluble oil emulsions to microbial oxidn is discussed. J. G. H.

1496. Quantitative determination of wear of engine parts by means of radioactive indicators. Yu. S. Zaslavskii and G. I. Shor. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk*, 1955, (4), 43–52.—Methods of wear assessment by measuring γ-activity of oil from engine or test rig containing activated (Fe^{59}) part; 3 variants are described, oil samples taken periodically, counter inserted in oil circuit, counter inserted and activity automatically recorded. Wear found agrees with gravimetric within 10% or less. Results, in single-cyl test engine with irradiated ring, are given for tests on lub oils containing anti-wear additives (unspecified) and on effect of S in gasoline; increase from 0·08% S to 0·6% caused 30% wear increase, using undoped oil (*cf.* Abs. **652**, **1297**, 1954). V. B.

1497. Graphical representation of viscosity of multigrade motor oils. J. L. E. Groff. *Rev. Inst. franç. Pétrole*, 1955, **10**, 811–14.—Description of procedure for depicting, on cartesian coordinates, SAE (or other) ranges, superimposed curves can show both V.I. and equivisc index E (*cf.* Abs. **1351**, 1955). V. B.

SPECIAL HYDROCARBON PRODUCTS

1498. Electric strength of transformer oil. M. E. Zein el-Dine and H. Tropper. *I.E.E. Monograph*, 1955, 1355, 11 pp.—Oil (B.S. 148) purified with Na and silica gel, then degassed in vac (10 cycles, 0·5 mm, 85°–90° C), filtered (No. 4 filter), filled into sealed test cell. For oil thus treated breakdown voltage (BDV) is approx 730 kV/cm and is substantially independent of duration of voltage application, gap, A.C. or D.C., temp (within limits −35° to +80° C), pressure (up to 200 p.s.i.), and (in uniform fields) electrode shape. Much higher BDV (up to 6000 kV/cm) obtained with microsec impulse voltages. With D.C., electrode metal influences BDV. Addition of H_2O decreased BDV, dropping this to *ca* 150 kV/cm for 100 p.p.m. and further decreasing only slowly to 500 p.p.m. Increase of gas content of oil caused marked drop in BDV to min, followed by rise with further gas content. For non-uniform fields polarity effects were observed. Results, together with findings of earlier workers, are discussed. V. B.

COAL, SHALE, AND PEAT

1499. Colloidal fuels. G. C. H. Sharpe. *Bull. B.C.U.R.A.*, 1955, **19** (3), 97.—A review is given of the present position regarding "colloidal fuel," *i.e.* coal-in-oil suspensions prepared for use as a fuel and having 98–99% passing through a 240 B.S. sieve (66 μ) with an upper size limit of particles of 72 B.S.S. (211 μ). Truly colloidal suspensions of coal in oil, *i.e.* having particles of upper size limit *ca* 0·1 μ, would be far too costly to produce for use as fuels.

The claim that colloidal fuel has a greater heat content than either the coal or oil alone only applies in the case where the gross cal. val. of the coal is more than 13,750 B.t.u/lb, *i.e.* only when exceptionally high quality (or low ash) coal is used. The main factor which will decide the user in conversion to colloidal fuel is likely to be economic—whether the difference between the local prices of coal and fuel oil is enough to show a saving on final fuel costs which would justify the expense of preparation of colloidal fuel and the disposal of the ash.

A description of the properties of colloidal fuel is given, covering such aspects as stability and visc. The methods of preparation, including grinding and mixing, are also dealt with.

Reference is made to the trials in the *Scythia* in 1932 when the existing oil-burning equipment was used, and no difficulties were found in handling and burning the colloidal fuel, except that the burners required cleaning more frequently than when oil was used. Tests in the *Berengaria* in 1935 and 1936 showed that loss of efficiency was caused by unburnt carbon. This difficulty was mostly overcome in a land installation by the provision of an additional air supply across the furnace floor. In land trials with a naval boiler, an efficiency of 84·0% was obtained when burning heavy fuel oil alone and 78·5–83·8% with various colloidal fuel mixtures.

Economic considerations show that the possible saving in using colloidal fuel is too small to warrant any capital expenditure for equipment for the preparation of this type of fuel. At the present time there is no economic reason for using colloidal fuel, but sufficient work has been done to demonstrate the practical possibility of using this type of fuel should circumstances demand it. W. W. G.

MISCELLANEOUS PRODUCTS

1500. Polyester resins and glass-resin laminates. M. Legrand. *Bull. Ass. franç. Tech. Pétrole*, 1955, (112), 381–90. Lecture. V. B.

1501. Non-ionic surfactants. M. A. Gerault. *Bull. Ass. franç. Tech. Pétrole*, 1955, (112), 391–404. Lecture. V. B.

CORROSION

1502. Corrosion in the petroleum industry. Pt I. F. H. Garner and A. R. Hale. *Corrosion Tech.*, 1955, **2** (5), 143.—The high capital investment per man employed in the petroleum industry makes it essential that the equipment should be kept in operation for max periods. This is possible only by eliminating, as far as possible, corrosion and erosion, and by careful inspection of the plant during shut-down periods in accordance with a scheduled programme. The importance of this problem can be judged by the cost of the corrosion of petroleum equipment, which has been estimated at £1/ton on all products.

The corrosion in dist and cracking plants is of 2 types: (1) electrochemical, in parts of the plant below 500° F, due to the presence, in addition to water, of hydrogen sulphide from the crude oil and hydrogen chloride from the hydrolysis of metallic chlorides present in the salt water found in the crude oil; (2) chemical, above 500° F, due to the attack by sulphur cpds. Chromium steels resist the high temp attack and stainless steels resist both kinds of corrosion.

The corrosion can be considerably reduced by removal of salt water from the crude oil by suitable electrical treatment and the injection into the vapour space, during processing, of alkalis such as caustic soda, sodium carbonate, or ammonia, maintaining the condensed vapours at pH 7·5–8. Corrosion due to the presence of naphthenic acids is best met by the use of alloy steel containing 18% chromium, 8% nickel, and 3% molybdenum.

The protection of fractionating towers and reactors against corrosion can be carried out by cladding the mild steel vessels with liners of corrosion-resisting alloys, and various methods of accomplishing this are described.

Wear due to erosion at point of entry of feed into towers is

generally guarded against by the use of wear plates which can be replaced when the unit is shut down for routine inspection.

In condensing equipment, where the corrosion can be particularly high, protection is obtained by the use of corrosion-resisting alloys such as Monel metal, aluminium-brass, or cupro-nickel. W. W. G.

1503. Here's an effective corrosion-control program. W. Swerdloff and M. Duggan. *Oil Gas J.*, 27.6.55, **54** (8), 91.—The injection by Magnolia Petroleum Co of an inhibitor of the polyethanol rosin amine type into the dried gas line resulted in the reduction of corrosion of lines in the glycol gas dehydration unit. Corrosion test coupons indicate effectiveness of the control programme, but continual attention and inspection are necessary to ensure max benefit. G. A. C.

1504. External casing corrosion control. J. D. Sudbury, J. E. Landers, and D. A. Shock. *J. Petrol. Tech.*, 1955, **7** (6), AIMME Tech. Paper No. 4055, 92–5.—It was estimated that the annual cost of casing corrosion in 22 fields representing 10% of the wells in the U.S.A. was $2,200,000. 77% of the failures reported were due to external corrosion. A major cause of external corrosion is believed to be electrolytic cells between various formation waters. Oxygen and certain bacteria can act as de-polarizing agents, removing the hydrogen film, which would otherwise retard corrosion. Casing potential profiles have been measured using probes 25 ft apart, and the observations indicated anodic slopes which embraced the zones within which corrosion had been troublesome. Varying amounts of current were then applied in the wells in order to remove the anode areas, the appropriate intensity being indicated by removal of the anodic slope. For depths down to 4400 ft currents not exceeding 3 amp were suitable, while for an 8700-ft well 7·5 amp was needed. Over a period there was a change in the current required, and the change was such that a smaller current was needed to remove all anodic areas, due to the slow build up of the polarizing film of hydrogen. There may also be precipitation of films of salts, such as $CaCO_3$. However, cathodic protection leads to accelerated attack on the oil string opposite the base of the surface pipe, but this is not sufficient to prevent the use of cathodic protective currents, and this failure may not be for 5–10 years. Various means are being tried for avoiding this trouble. G. D. H.

1505. The influence of vanadium pentoxide on the high-temperature scaling of heat-resisting alloys. W. Betteridge, K. Sachs, and H. Lewis. *J. Inst. Petrol.*, May 1955, **41** (377), 170.—Previous investigations have shown that all alloys which have been tested are to some extent corroded by vanadium pentoxide at temp above *ca* 600° C. The investigations reported here fall into 2 main classes: (1) determination of rate of corrosive attack under various conditions; and (2) determination of effect of corrosion on mechanical properties. The materials studied were mainly Ni–Cr heat-resisting alloys of various types, but a few samples of austenitic stainless steel and one Co-base alloy were included. The results obtained were examined to determine, as far as possible, the mechanisms whereby the presence of an ash accelerates the corrosion rate of an alloy, and also to assess the effect of such corrosion on the serviceability of a component. 7 literature refs. U. M.

1506. Corrosion and corrosion protection in underground mineral oil tanks. H. Kiemstedt. *Erdöl u. Kohle*, 1954, **7** (12), 833–5.—The prevalence of underground storage tanks built during the war makes it desirable to take some precautions to prevent wastage due to corrosion. The main form of corrosion, that resulting in pitting of the walls of the tanks, is reduced by coating the inner walls of the tanks with cement by means of a spray gun. W. W. G.

1507. New Swedish device counters corrosion in ships' engines. Anon. *Sci. Lubric.*, 1955, **7** (3), 38–9.—Lengthy investigations by Brostöms of Gothenburg of the deterioration of lub oil and corrosion damage to the engines of diesel-powered ships has resulted in their being attributed to electrical phenomena, and details are presented of equipment installed which eliminates the potential between the movable and fixed parts of the engine, establishing a balanced electron position and eliminating the electrolytic action. J. G. H.

1508. Use of internal corrosion inhibitors in Le Havre–Paris pipeline. J. Vincent-Genod. *Bull. Ass. franç. Tech. Pétrole*, 1955, (112), 405–18.—Details of 2-year operating experience. Inhibitor is $NaNO_2$ (4–24% soln in 0·2N-NaOH). 1·3 p.p.m. are used on longer sections. Decreased traffic requires increase in inhibitor concn. No effect on gum content of product. Curves are given showing effect on quantity of sediment removed and roughness coeff, former tends to zero, latter to const after line has become clear. Section of line removed for examination was in satisfactory condition. V. B.

ENGINES AND AUTOMOTIVE EQUIPMENT

1509. Gas turbine running on residual fuel. Anon. *Engineer, Lond.*, 1955, **199**, 884.—A 10 × 100 hr test on a Ruston 3CT gas turbine has been carried out using 3·5% S residual fuel containing 50 p.p.m. V and 26–62 p.p.m. Na in 300 p.p.m. total ash. Mg cpd additive was also employed. Gas temp in range 650°–750° C. Turbine blading was washed for 2 hr every 100 hr with mains water, without stripping turbine, 90% of deposit on first row of stator blades was removed thereby. Condition of blades was good after tests, further work is in progress. 3 photographs. A. C.

BOOK REVIEWS

The Chemistry of the Petroleum Hydrocarbons. Vol. 1. Ed. B. T. Brooks, C. E. Boord, S. S. Kurtz, and L. Schmerling. New York; Reinhold Publishing Co., 1954. Pp. viii + 664. 144*s*.

The scope of the first volume of the series is somewhat wider than the title suggests. It is, however, inevitable that in discussing petroleum hydrocarbon chemistry a number of allied subjects, more physical than chemical, must be included. On the other hand, the decision to exclude from the series as a whole such subjects as the uses of petroleum products, their assessment, standard methods of test, process engineering, and equipment design was a wise one if only to avoid the whole reaching encyclopædic proportions.

The plan adopted by the editors has been to enlist the aid of a number of contributors with first-hand knowledge of the various aspects of petroleum hydrocarbon chemistry to prepare individual chapters on their subject. In the preparation of the present volume over 20 well-known authorities assisted—all American, with the exception of one. The subjects covered include the following: Hydrocarbons in Natural Gases; Hydrocarbons in Gasolines; Kerosines; Gas Oil and Lubricating Oils; The Composition of Petroleum Waxes; Types of Crude Petroleum; The Composition of Shale Oils; The Origin of Petroleum; Extractive and Azeotropic Distillation; Separation of Aromatics by Selective Adsorption; Principles of Solvent Extraction; Separation of Paraffins by Urea and Thiourea; Physical Properties and Hydrocarbon Structure; Ultra-violet Spectra of Hydrocarbons; Molecular Structure and Spectroscopic Data; Analytical Applications of Infra-red and Raman Spectroscopy; Mass Spectrometry of Hydrocarbons; Analysis and Composition of the Heavier Petroleum Fractions; Preparation of Pure Paraffins and Olefins;

Synthesis of Low Molecular Weight Alicyclic Hydrocarbons; Synthesis of Low Molecular Weight Aromatic Hydrocarbons; Synthesis of High Molecular Weight Hydrocarbons; The Fischer–Tropsch Process.

Throughout the authors have stressed the theoretical considerations involved, thereby greatly enhancing the usefulness of the volume to those who require the more fundamental background but have not the time or opportunity to study the more extensive treatises or the original papers. Some of the subjects have been treated more fully elsewhere, sometimes by the authors themselves, but this does not detract from the value of the present work, which, when complete, will gain by containing concise and authentic accounts of practically every aspect of petroleum chemistry. The absence of a chapter on fractionation is rather unexpected, as this volume is mainly concerned with the composition of petroleum, and the separation and analysis of hydrocarbon mixtures and extractive and azeotropic distillation are discussed in some detail. The chapters concerned with spectroscopy will be particularly welcome to those wishing to know something of the theoretical basis of this invaluable analytical tool. Of the chapters on the synthesis of hydrocarbons, that on the preparation of the high molecular weight hydrocarbons is exceptionally well done. It should be read by all those in the academic world who regard the synthesis of hydrocarbons as insufficiently attractive for research. In discussing the synthesis of alicyclic hydrocarbons (naphthenes) in relation to petroleum, it is surprising that so much consideration is given to the *cyclo*propanes and *cyclo*butanes, since these are not normally present in petroleum or of special interest as potential fuels. Conversion reactions of hydrocarbons have been entirely left to later volumes.

The editing has been well done, although some of the references are incorrect and ascribe results to the wrong authors.

It is greatly to be regretted that the high cost of these volumes will prevent their being on the shelves of all those interested in petroleum chemistry and, in particular, petroleum research. If the succeeding volumes maintain the same high standard as the first, the series will be an extremely valuable addition to any library. S. F. B.

Gas Turbine. Vol. 2. Some Fundamentals of Combustion. D. L. Spalding. London: Butterworths Scientific Publications, 1955. Pp. x + 250. 40*s*.

Under the general editorship of J. Hodge, the publishers issue the second of a series of text-books on the gas turbine, the one previously published covering cycles and performance estimation. The text-book is aimed at revealing present-day knowledge of the fundamentals of combustion, and in 247 pages covers thermodynamics, fluid flow, heat and mass transfer, heat and mass transfer with chemical reaction, chemical effects in combustion, and lastly, engineering implications.

The primary objective of the author in reviewing existing fundamental knowledge would appear to have been achieved almost completely, and as such the book serves the purposes of those engaged in scientific research. The task of reviewing the contents is difficult in the face of the decision of the publishers to present a second volume on combustion practice. At the risk of doing the author an injustice, attention is drawn to certain omissions or inadequate treatment of aspects of combustion which might reasonably be classed as fundamental. For instance, heat emission from the flame is important in estimating the degree of air cooling required to maintain the flame tube in good condition over long periods. Something less than justice is done to the important problem of linear scale, a most important issue from the financial, practical, and technical standpoints. The role of unburnt carbon in ash-bearing fuel oils is another vital problem in industrial gas turbines. The inhibiting effect of carbon on ash stickiness has been amply demonstrated, and the combustion engineer is left with the nice problem of balancing unburnt carbon against its effectiveness in "containing" the ash.

The claim on the dust cover that "considerable progress has been made in providing a basis of a rational design method" for combustion chambers is doubtless putting the case too strongly. The need to minimize pressure loss for maximum combustion intensity has resulted in a multitude of air–oil registers, and some of these arrive at adequate performance with surprisingly different geometry. That this is a result of the laws of nature is self-evident, but the situation provides no solace (nor data) to the designer when extrapolation is required in the directions of linear scale, ambient pressure, air preheat, etc. In spite of advances in the fundamentals of air–oil mixing processes, the choice of mixing device and ability to extrapolate performance remain on an empirical and qualitative basis.

Some interesting and informative books have been written on the fundamentals of combustion and others on the practice. A third possibility would be a dissection of a number of successful designs in an attempt to assess, firstly, the correctness of fundamental theories and, secondly, to estimate how nearly theoretical conditions are achieved. It is with great expectations that the second volume is awaited. I. G. B.

ADDITIONS TO THE LIBRARY

Organic Chemistry Simplified. R. Macy. 2nd edn. New York: Chemical Publishing Co. Inc., 1955. Pp. 611. $12.00.

This book was designed for two main purposes. The first was to provide organic chemistry students with a simplified approach to their subject, and secondly, to provide the worker in chemistry with a book for home study. Not only does it appear to fill both these purposes very well, but it should serve as a good refresher. It is divided into four main parts: (1) the unique position of the carbon atom in chemistry; (2) the architecture of carbon compounds; (3) the classification of carbon compounds; (4) special topics in organic chemistry.

Drilling and Production Practice 1954. Division of Production, American Petroleum Institute. New York: A.P.I., 1955. Pp. 308.

British Chemical Plant, 1955 Edition. London: British Chemical Plant Manufacturers Association, 1955. Pp. 393.

British Standard:

B.S. 1319: 1955. Medical Gas Cylinders and Anaesthetic Apparatus. Pp. 23. 5*s*. net, post free.

ABSTRACTS

	PAGE
OILFIELD EXPLORATION AND EXPLOITATION	
Geology	163 A
Geophysics and Geochemical Prospecting	164 A
Drilling	164 A
Production	164 A
Oilfield Development	165 A
TRANSPORT AND STORAGE	165 A
REFINERY OPERATIONS	
Refineries and Auxiliary Refinery Plant	165 A
Distillation	167 A
Absorption and Adsorption	167 A
Cracking	167 A
Polymerization	168 A
Alkylation	168 A
Isomerization	168 A
Chemical and Physical Refining	168 A
Special Processes	168 A
Metering and Control	168 A
PRODUCTS	
Chemistry and Physics	168 A
Analysis and Testing	169 A
Crude Oil	169 A
Engine Fuels	169 A
Gas Oil and Fuel Oil	169 A
Lubricants	169 A
Bitumen, Asphalt, and Tar	170 A
Special Hydrocarbon Products	170 A
Derived Chemical Products	170 A
Coal, Shale, and Peat	171 A
Miscellaneous Products	171 A
CORROSION	171 A
ENGINES AND AUTOMOTIVE EQUIPMENT	172 A
SAFETY PRECAUTIONS	172 A
MISCELLANEOUS	172 A
BOOK REVIEW	172 A
ADDITIONS TO THE LIBRARY	173 A

AUTHOR INDEX

The numbers refer to Abstract Numbers

Abbott, M. D., 1558
Abenza, L., 1579
Ackroyd, G. C., 1581
Anderson, T. H., Jr., 1535
Arbiter, N., 1576

Baillie, A. D., 1511
Barsley, G., 1604
Bauman, E., 1603
Boelhouwer, C., 1565
Boon, E. F., 1542–3
Bowler, V. O., 1537
Bridgeman O. C., 1580
Brien, E. B., 1573
Brison, R. J., 1532
Brown, G. G., 1522
Bullock, H. C., 1532
Butler, R. M., 1540

Capdevila, N. R., 1554
Carriere, J. E., 1607
Chalmers, J. M., 1532
Childs, J. H., 1578
Clark, W. G., 1547
Conison, J., 1539
Cornell, D., 1526
Corrigan, T. E., 1571
Cramer, F. R., 1609

Dart, J. C., 1552
Deering, R. G., 1525
de Witte, L., 1516

Elledge, L. R., 1532
Evans, E. A., 1585

Fiske, C. R., 1534
Flood, J. E., 1532
Franck, H-G., 1591

Garner, F. H., 1605
Gates, C. F., 1522
George, C., 1606
Gery, W. B., 1532
Gumz, W., 1616
Gunmser, R. R., 1555

Halbouty, M. T., 1510
Hale, A. R., 1605
Hantha, C. H., 1599
Hardin, G. C., Jr., 1510
Heinrich, F. J., 1595
Heinrich, J., 1587
Huddlestone, J. G., 1577
Hunter, E. E., 1614

Jelen, F. C., 1530
Jonash, E. R., 1578

Kahler, H. L., 1606
Kalichevsky, V. A., 1569
Kamm, V. M. G., 1545
Kaucic-Somogy, M., 1601
Keller, G. J., 1538
Killer, M., 1515
Kirshbaum, E., 1548
Kleinschmidt, L. R., 1593
Klohn, C. H., 1527
Kuns, K. S., 1521

Landen, R., 1600
Latimer, J. R., 1520
Legataki, T. W., 1580
Lewicki, W., 1583
Lewis, E. H., 1557
Liedholm, G. E., 1558
Lindsay, R. E., 1577
Lowe, A. G., 1581
Lundeen, R. W., 1547

McArd, G. W., 1519
McGarry, F. J., 1602
Mallison, H., 1594
Mernitz, P., 1534
Mills, G. A., 1552
Moorman, J. W., 1556
Munk, P., 1550

Oblad, A. G., 1552
Olley, R., 1536
Olson, W. T., 1578
Orr, A. R., 1562

Parekh, B. H., 1551
Pearce, C. A. R., 1570
Peary, C. C., 1552
Podbielniak, W. J., 1572
Polderman, L. D., 1598
Porter, H. F., 1532
Preston, S. T., 1572
Price, W. C., 1575

Raiford, L. L., 1555
Resen, F. L., 1531, 1608
Rick, W., 1589
Roberts, R. W., 1526
Rossoff, C., 1512

Sag, N., 1546
Sager, F., 1564
Sarno, D. H., 1553
Schweisheimer, W., 1611
Sef, F., 1601
Shearin, H. M., 1520
Sherwood, P. W., 1533, 1561, 1597
Silk, P. B., 1615
Simonovic, M., 1524
Smith, D. T., 1513–14
Smith, J. C., 1532
Strong, A. R., 1529

Tanaskovic, P., 1524
Tangel, O. P., 1533
Tasic, M., 1524
Temme, T., 1590
Tixier, M. P., 1521
Twaits, W. O., 1523

Umholtz, C. L., 1541

Valls, J., 1579
Valois, M., 1599
van Lelyveld, H., 1564
van Winkle, M., 1541
Vener, R. E., 1553
Voss, K., 1548

Wachal, A. L., 1610
Waterman, H. I., 1565
Weber, G., 1618
Wichert, P., 1592
Wilford, A. T., 1584
Williams, C. G., 1612
Wilson, S. G., 1528
Winn, F. W., 1538

OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

1510. Factors affecting quantity of oil accumulation around some Texas Gulf Coast piercement-type salt domes. M. T. Halbouty and G. C. Hardin, *Jr. Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 697.—This paper represents a new kind of research on salt domes. Its primary purpose is: (1) to determine the cause of the wide range in the quantity of oil accumulation on various piercement-type salt domes; and (2) to determine if some formula may be applied that would generally ascertain the productivity of a dome before an exploration programme is conducted thereon. 24 domes in the Texas Gulf Coast were studied; 12 are located in the Frio formation trend, and 12 in the Yegua formation trend. Calculations, based on the amount of structural uplift of the sediments around a dome and the area in sq. miles affected by the uplift of the dome, produced an area–uplift factor which, when considered with other factors and applied properly, reveals the approx amount of oil which the dome is ultimately expected to produce. E. N. T.

1511. Devonian system of Williston basin. A. D. Baillie. *Bull. Amer. Ass. Petrol. Geol.*, 1955, **39**, 575.—The Devonian strata are divided into 4 major lithologic units that are, in ascending order, Elk Point group, Manitoba group, Saskatchewan group, and Qu'Appele group.

The Williston basin area includes more than 100,000 sq. miles of Devonian marine carbonate strata greater than 1000 ft thick that contain many favourable aspects for future petroleum exploration. Fragmental zones, biostromes, and bioherms occurring at several horizons form potential reservoirs, and in places, where associated with structure, contain commercial quantities of oil. Pre-Mississippian erosion with subsequent Mississippian overlap in southern N. Dakota and E. Montana suggests that favourable truncation traps may be present in these areas. E. N. T.

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GEOPHYSICS AND GEOCHEMICAL PROSPECTING

1512. 25 years of geophysics in wells. C. Rossoff. *Bull. Ass. franç. Tech. Pétrole*, 21 May 1955, (111), 275–310.—The first commercial electric log was run 25 years ago. In 1933 6 engineers were at work with 3 sets of equipment; in 1953 there were 950 engineers with 500 sets of equipment, and the annual expenditure on research and development was $4,000,000.

The various techniques in use are briefly described, with a short account of the principles involved and the purposes of the measurements. There is discussion of S.P. and resistivity measurements, dipmeters, estimation of porosity, permeability, and saturation, invasion, micrologs, laterologs, micro-laterologs, induction logs, γ and neutron logs, sidewall sampling, caliper logs, inclination surveys, detection of points of lost circulation, perforating, collar location, and detection of the point at which drill-pipe is stuck; velocity surveys in wells, including continuous surveys, density measurements by means of γ-rays, with the possibility of estimation of porosity, measurement of magnetic fields and magnetic susceptibility, temp surveys. G. D. H.

1513. Geophysical methods of oil prospecting. Pt IV. Seismic methods. D. Taylor Smith. *Petroleum, Lond.*, 1955, **18** (6), 211–17.—Seismic method is the most widely used geophysical method. It can indicate with great precision the disposition of small, gentle structures at varying depths. Although the refraction technique is extremely capable of detecting shallow salt domes, it has been largely superseded by reflection methods. Marine prospecting is also discussed, and the advantages and limitations of the seismic method are given. J. B. S.

1514. Geophysical methods of oil prospecting. Pt V. Well-logging methods. D. Taylor Smith. *Petroleum, Lond.*, 1955, **18** (8), 285.—The 3 most useful physical measurements possible in wells are resistivity of the rock, natural potentials, and variation of radio-activity of the layers through which the borehole passes. These measurements enable correlation of strata and identification of the lithology to be carried out. Well-logging is more qualitative than quantitative, but is one of the most important explorative tools. Normal Sonde and Lateral Sonde methods of investigation are described in detail. J. B. S.

DRILLING

1515. Selecting cement slurry composition and calculating cementation of oil wells. M. Killer. *Nafta (Yugoslavia)*, 1955, **6** (3), 83–6.—Factors affecting the thickening time of a cement slurry, *i.e.* (1) the composition and quality of the cement; (2) the composition of the slurry; (3) the well temp; and (4) the presence and concn of chemical agents, promoting or inhibiting the binding of the cement are discussed, and the construction of a thickening-time tester described. Diagrams for the calculation of cement required, as well as of minimum slurry preparation and placement time are also presented. (Author's abstract.)

1516. Study of electric log interpretation methods in shaly formations. L. de Witte. *J. Petrol. Tech.*, 1955, **7** (7), AIMME Tech. Paper No. 4076, 103–10.—A review of the principles employed and the evidence brought forward in their support in the proposed methods of qualitatively interpreting electric logs in shaly sands suggests that the predictions are likely to be pessimistic with regard to the presence of commercial oil accumulations.

A new set of electrochemical relationships are derived using the concept of reduced ionic activity of the double layer counter ions near the negatively charged rock surfaces in shaly sands. Experimental evidence is given in support of equations which give the S.P. as involving the concn of fixed charges in the internal soln of the rock network as a general parameter. Formulæ are obtained for the conductivity of water-bearing shaly formations, and these agree with known empirical equations. The Tixier relationship equating the product of apparent formation water resistivity and apparent formation factor with the resistivity of the sand with 100% saturation of formation water is supported.

A formal basis is given for the quantitative interpretation of electric logs for shaly oil-bearing rocks, and a field example is presented. G. D. H.

1517. Proposed letter symbols for electric logging. Anon. *J. Petrol. Tech.*, 1955, **7** (7), 31.—A series of symbols for use in mathematical studies relating to electric logging are given, together with the definitions and dimensions. Comments and suggestions are invited. G. D. H.

1518. Dyson boiler transporter. Anon. *Auto. Engr*, 1955, **45** (8), 345.—The trailer described is for the transport of locomotive-type boilers for oilfield drilling equipment. The frame, 41 ft long, forms a permanent mounting for the boiler, and on site the bogies can be quickly removed. T. T.

1519. Oil from beneath the sea bed. G. W. McArd. *Mech. World*, 1955, **135** (3432), 302.—Methods of sea bed exploration are described, and details of various drilling platforms given. T. T.

PRODUCTION

1520. Advantage of a co-ordinated formation evaluation programme. H. M. Shearin and J. R. Latimer. *J. Petrol. Tech.*, 1955, **7** (7), 11–15.—The advantage of a co-ordinated formation evaluation programme is that sufficient data on the reservoir rock and its fluids are obtained, in usable form at the time needed at reasonable cost. Reasonably accurate estimates of recovery become possible, and the merits of pressure maintenance can be compared with the application of secondary recovery after primary depletion. The sources of information are coring and core analysis, well logging, and testing. Key wells at uniform intervals should be cored and logged, and the logging method, which, on the basis of key well data, gives the best quantitative data, is applied to other wells, which should be completed similarly to the key wells. Logs should be used to select fluid contacts where practicable. Mud should be uniform and its properties must be known.

The application of a co-ordinated formation evaluation programme in a Strawn limestone field is discussed. Among other things it was of value in analysing problem well behaviour. G. D. H.

1521. Temperature surveys in gas producing wells. K. S. Kunz and M. P. Tixier. *J. Petrol. Tech.*, 1955, **7** (7), AIMME Tech. Paper No. 4077, 111–19.—Temp logs have been run in flowing gas wells, and these have characteristic shapes, according as there are one or more producing zones. Radioactivity and induction logs aid in interpreting the temp logs. By a graphical method in certain cases a fairly good estimate can be made of the relative contributions of the various producing zones in a single well. The method is applied in several cases, and the estimates are compared with direct observations.

It is inferred that the gas producing zones are not always in the main reservoir formations; they may be in shaly intervals, especially where there are many sand–shale interfaces, and this state may be more prominent after fracture treatment. Sometimes hydraulic fracturing leads to gas entry at depths different from those which yielded gas before fracturing.

The mathematical basis of the method of interpretation of the temp logs is set out. G. D. H.

1522. Production engineering aspects of Shannon reservoir, Cole Creek field, Wyoming. C. F. Gates and G. G. Brown. *J. Petrol. Tech.*, 1955, **7** (7), 19–24.—The Cole Creek field is a gentle elliptical dome in the W. part of the Powder River basin. The discovery well was completed in 1940, and 32 producing wells, all pumpers, had been completed on 40-acre spacing through 1945. The producing sand (Shannon) is *ca* 4500 ft deep, averages 17½ ft in thickness, is fine to medium grained with thin shale partings, and has a porosity of 18·7%

and average air permeability of 51 mD. The initial reservoir pressure was 1700 p.s.i., the bubble point 750 p.s.i., soln G.O.R. 120 cu. ft/brl, and reservoir oil visc 3·5 cP.

Hurst's water drive equation for an infinite reservoir permitted pressure-rate predictions which agreed closely with performance, and it was found empirically that for a given oil rate by water drive the pressure between the perimeter and the oil producing area was about proportional to the cumulative oil produced. The calculations correctly indicated a max (hitherto not apparent) oil rate.

6 injection wells round the edge of the field have reduced net withdrawals to zero, and apparently ⅔ of the injected water rate replaces former natural water encroachment rate.

Productivity indices have been kept high by keeping bottom-hole pressures near the bubble point, closing in casing heads, and using "bubble-point pumps." Shooting has greatly increased these indices. Recovery efficiency may exceed 33%. G. D. H.

OILFIELD DEVELOPMENT

1523. Canadian oil at the eighth milestone (1947–1955). W. O. Twaits. *J. Petrol. Tech.*, 1955, **7** (7), 7–10.—The discovery of oil at Leduc in 1947 was an important event in Canadian oil history. In 8 years Canada has become able to supply virtually all its oil needs W. of Toronto. Daily output has risen from 20,000 to 260,000 brl, and reserves from 72,000,000 to 2,750,000,000 brl.

In book value U.S. investments represent 50–60% of the total investment in the Canadian oil industry. Cumulative expenditure to date is $2,600,000,000. Legislation and general conditions have led to rapid development. The needs of the Prairie Provinces were met in 1949. A 1700-mile pipeline, with an ultimate capacity of 300,000 b.d., was then built eastwards to Ontario. In 1953 the Trans-Mountain pipeline to British Columbia was completed. On account of geography Canadian crude prices must reflect a heavy transportation "penalty," and the transport system is relatively inflexible. The well-head values of Canadian crudes are 22 c/brl or more below those from some U.S. and other sources.

It is possible that Canada may never be able to supply the easternmost area economically. A protective tariff has been suggested to help in some directions.

It seems likely that W. Canada's oil markets will grow city by city and refinery by refinery, rather than by the big jumps which have taken place in the past 8 years. G. D. H.

TRANSPORT AND STORAGE

1524. Collection and transportation of crude oil. M. Simonovic, P. Tanaskovic, and M. Tasic. *Nafta (Yugoslavia)*, 1955, **6** (3), 87–93.—The paper outlines the methods of collection and transportation of crude oil and the calculation customarily applied in design and installation of crude pipelines with special regard to the transportation of heavy crude oils requiring preceding treatment, usually preheating. Heating methods are described. Special attention is paid to electrically-heated pipelines, and the method of installing such lines at present in use in Canada and W. Germany is described. (Authors' abstract.)

1525. A billion dollars and 83,000 miles. R. G. Deering. *Oil Gas J.*, 13.6.55, **54** (6), 179.—A quarter of the pipeline mileage of the U.S.A. is in Texas. Tables show companies owning the mileage, sizes, and capital involved. G. A. C.

1526. Designing relief lines. R. W. Roberts and D. Cornell. *Petrol. Refin.*, 1955, **34** (7), 141–3.—A method for the design of relief piping for the isothermal flow of real gases using the Clinedinst Integral has been developed and compared with soln using a constant average compressibility factor and the assumption of ideal gases. The ideal gas soln was found to give a conservative result. Small differences in dia of the pipe amounting to a max of only *ca* 5% were obtained by the 3 methods, but variations in design length of over 25% were found for the 3 methods, the ideal gas soln again giving a conservative result. R. L. R.

1527. Gas-pipeline-network flow calculations. C. H. Klohn. *Oil Gas J.*, 25.7.55, **54** (12), 178.—A method is given by which flow, pressure loss, and overall efficiency can be determined, design performance predicted, and "parasitic" pressure losses uncovered. The calculations are based on inventory of pipe sizes, approx flows in and out of network, and approx operating temp and pressures. G. A. C.

1528. Chemicals cut pipeline R.O.W. upkeep. N. G. Wilson. *Oil Gas J.*, 8.8.55, **54** (14), 88.—Results are presented of a 4-year programme by Shell Pipe Line Corpn to study chemical control of weeds and brush along right-of-ways of pipelines, communications and power lines, and in tank farms. The programme was successful, and a saving of 75% over hand-clearing is achieved by use of chemicals. G. A. C.

1529. Shipping in larger unit loads. A. K. Strong. *Chem. Engng*, 1955, **62** (8), 178.—The economics of changing the size of container in which solids and liq are transported are discussed, with examples. D. J. S.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

1530. Replacement problems. F. C. Jelen. *Chem. Engng*, 1955, **62** (8), 181.—The replacement of equipment is discussed, and examples based on the use of capitalized costs are given. D. J. S.

1531. This cleaning program really cleans. F. L. Resen. *Oil Gas J.*, 13.6.55, **54** (6), 221.—The chemical cleaning process is described as used at Gulf Oil Co, Port Arthur, Texas, refinery. Towers and heat exchangers are dealt with by the method. For the exchangers, in place, soak and steam detergent procedures are used according to circumstances. G. A. C.

1532. Solids–liquid separation. *Chem. Engng*, 1955, **62** (6), 176–238.—6 articles are printed on solids–liq separation.

I. **How to approach your separation problems.** J. C. Smith. The selection of a suitable separator is divided into an 8-stage problem, and a table shows the essential data required. The methods available for simple lab tests before selection are discussed.

II. **Wet screens.** H. C. Bullock. The use of wet screens provides a method, lying between settling tanks and filter presses, of handling large quantities with minimum floor space and maintenance charges. The available types are discussed and the methods of producing the vibrations are described in detail. The operating variables are discussed and the screening surfaces in use are mentioned. The methods of obtaining cost data are described.

III. **Filters.** J. M. Chalmers, L. R. Elledge, and H. F. Porter. Since filters cannot be designed from the use of basic equations, information on methods available is given to enable engineers, in conjunction with plant manufacturers, to obtain the correct equipment. The theory of filtration is discussed, including recent developments. Lab test work is mentioned. The factors governing selection of equipment are presented, and a chart lists specific equipment with the type of slurry to

be expected. A large section is devoted to the commercial equipment and accessories available. The types are illustrated and described in detail.

IV. **Centrifugals.** J. E. Flood. The applications of centrifuges are discussed. The theory and methods of selection which can be used to narrow the choice are given. Operating characteristics of typical centrifuges are discussed and the equipment of 4 manufacturers is described, giving the characteristics of several sizes.

V. **Thickeners.** W. B. Gery. Thickeners are used to separate solids from large quantities of liq of gravity, with the emphasis frequently on the solids produced. The basic equipment, combination units, and aux equipment are discussed. The methods of design and equipment and operating costs are described.

VI. **Wet cyclones.** O. F. Tangel and R. J. Brison. The use of wet cyclones is a fairly recent application of the cyclone in the separation of solids in the 5–150-μ region. The cyclone is principally used as a separator, as distinct from a thickener. The method of operation, design variables, and maintenance are discussed. Typical wet cyclone installations are illustrated. D. J. S.

1533. Modern American methods of acid sludge disposal. P. W. Sherwood. *Petroleum, Lond.*, 1955, **18** (6), 224–6.—3 main methods are available for disposing of acid sludge in large volumes: (1) use as fuel under boilers; (2) hydrolysis, giving fuel oil and "black" acid; (3) high temp decomposition. Method (1) is only used if the volume is small and other methods uneconomic, as valuable material is destroyed and SO_3 content of flue gases increased. In (2) separation is achieved by treating sludge with hot water. The recovered acid has conen of 30–50% H_2SO_4 and is relatively impure. It is concentrated in 2 stages to 86–88%. In (3) sulphuric acid is reduced to SO_2, separated and re-oxidized to SO_3. This method is suitable only where large volumes of sludge are to be handled. J. B. S.

1534. Refinery waste water cleaned by flotation. C. E. Fiske and P. Mernitz. *Petrol. Engr*, 1955, **27** (6), C31.—The dissolved air separator picks up the water and pumps it to a retention tank, where it is saturated with dissolved air at 25–35 p.s.i.g. From the retention tank the waste flows through a pressure release valve to the flotation tank. The oil is swept to the surface by the countless colloidal air bubbles, and the oily froth is swept off by continuous chain scrapers. J. B. S.

1535. How to select plant drives for process heat balance. T. H. Anderson, Jr. *Chem. Engng*, 1955, **62** (7), 211.—The use of steam-driven plant as a source of process heat is considered in detail, and it is shown how to select the best drive to ensure economy. D. J. S.

1536. Direct-fired heaters in chemical engineering. R. Olley. *Petroleum, Lond.*, 1955, **18** (7), 246–50.—Direct-fired heat-transfer equipment has many uses, ranging from provision of heat for dist to heating of fuel oil, preheating gases, etc. The merits of direct *v.* indirect heating are considered in relation to actual problems, and various types of heaters commercially available are described. Control of coke formation without headers is considered, principally the economy of burning out coke. Use of valves and thermometers in parallel passes to ensure even distribution of load is also discussed. J. B. S.

1537. Uniflex trays. V. O. Bowler. *Petrol. Refin.*, 1955, **34** (7), 118–19.—New operating data for Uniflex trays are given from commercial operating units. The details of tray design and construction were presented in *Petrol. Refin.*, May 1954. Although firm conclusions cannot be drawn from this data, it appears that the Uniflex tray efficiencies are at least equivalent to those of well designed bubble cap trays. R. L. R.

1538. Slot openings in bubble caps. F. W. Winn and G. J. Keller. *Petrol. Refin.*, 1955, **34** (7), 111–13.—Nomographs are presented to give the slot opening for triangular, trapezoidal, and rectangular slots as a function of the dimensions of the slot, vapour rate, and density of liq and vapour. The equations cannot be used, however, for slot openings below the point of incipient bubbling or beyond the point of fully opened slots. R. L. R.

1539. What a relief valve can do. J. Conison. *Petrol. Refin.*, 1955, **34** (7), 137–40.—By diagnosing instances in which equipment may be subjected to over- or under-pressurizing and applying the proper relief or vacuum valves, it is possible to ensure safe operation and protection of equipment. Typical cases listed cover approx 95% of all likely cases. The aspects due to failure of instruments or equipment, fire, blocked inlet and/or outlet pipes, and water hammer are also dealt with. R. L. R.

1540. Fast methods of minimum plates. R. M. Butler. *Petrol. Refin.*, 1955, **34** (7), 109–10.—A new method is presented to assist in fractionator design by which the minimum number of plates required for the separation of a complex hydrocarbon mixture at atmospheric pressure is determined from a diagram. An equation is derived from the Fenske relationship and a practical example worked out. R. L. R.

1541. Efficiency and pressure drop for perforated plates. C. L. Umholtz and M. van Winkle. *Petrol. Refin.*, 1955, **34** (7), 114–17.—New experimental data obtained from a small dia column are presented giving efficiency and pressure drops for 3 different sized perforated plates. Air, kerosine, water, 10% ethanol–water, and *m*-xylene were utilized in the tests to determine the hydraulic operational characteristics of the column. For the efficiency runs, binary mixtures such as o-*m*-xylene, benzene–carbon tetrachloride were used, the former giving the highest efficiency and the latter the lowest. R. L. R.

1542. Symposium: Pumps for the chemical industry. Some fundamentals about pumps. E. F. Boon. *Ingenieur, 's Grav.*, 13.5.55, **67** (19), Ch 27–1.—The fundamental equations concerning the operation of positive displacement pumps (reciprocating and vane pumps), impulse pumps (centrifugal pumps and ejectors), and visc pumps (extruders), are derived from the first law of thermodynamics. Mathematical expressions are given for the various types of losses. The paper ends with a few practical calculations in MKS units. G. F. T. C.

1543. Some notes on shaft seals for chemical pumps. E. F. Boon. *Ingenieur, 's Grav.*, 13.5.55, **67** (19), Ch 51–8.—The properties of conventional soft, metallic, and grease packings are discussed, and heat flows through spindle and packing calculated. A description is given of the equipment for measuring leakage and power consumption. A modern version of the mechanical seal is equipped with teflon and graphite sealing rings. Drawings are given of 3 types of glandless pumps. G. F. T. C.

1544. Centrifugal acid pumps. H. van Lelyveld. *Ingenieur, 's Grav.*, 17.6.55, **67** (24), Ch 54–0.—Some details are given of the various types of centrifugal acid pumps with regard to the required duty and the properties of the liq to be pumped. Mention is made of the different ways in which the pump gland is protected, *i.e.* by the use of backvanes during operation and of centrifugal governors under stationary conditions. Materials of construction are recommended for use with sulphuric, hydrochloric, and nitric acids in a range of conen and temp. A number of common failures and troubles are referred to. 7 figs. G. F. T. C.

1545. Symposium: Pumps for the chemical industry. Slurry pumps. V. M. G. Kamm. *Ingenieur, 's Grav.*, 17.6.55, **67** (24), Ch 49–4.—After dealing with such properties of slurries as govern the choice of the pump type a short survey is given of the more common types of slurry pumps. Modified centrifugal pumps appear to be the most versatile, but when used for feeding a filter the extensive attrition of the solids can give

rise to low filtration rates. The influence of recycling with different types of pump on filtration rate of a given slurry is illustrated with 2 graphs. 9 figs. G. F. T. C.

1546. Rate of centrifugal pumps in use. N. Sag. *Chem. Engng*, 1955, **62** (7), 223.—A simple graphical method, with a worked example, is given to show how to evaluate the performance of individual pumps feeding to a common line. D. J. S.

1547. Cost of installing centrifugal pumps. R. W. Lundeen and W. G. Clark. *Chem. Engng*, 1955, **62** (8), 189.—Cost data, to be added to capital cost of a pump, are given to enable the installation charges of a single centrifugal pump to be calculated. D. J. S.

DISTILLATION

1548. A dimensionless treatment of heat transfer in a vertical evaporator tube. E. Kirshbaum. *Ingenieur, 's Grav.*, 3.6.55, **67** (22), Ch 39–48.—For the first time a non-dimensional equation is presented enabling the calculation of vertical tube evaporators. A detailed description is given of the monotube pilot evaporator used during the investigation. Electronmicrographs of the internal tube surface show irregularities which act as boiling nuclei. Temp profiles are given for different working conditions and feeds. Satisfactory correlation is obtained between the suggested equation and experimental data. 17 figs, 2 tables. G. F. T. C.

1549. Practical proof of laboratory data. Anon. *Chem. Engng*, 1955, **62** (8), 116.—The design of 2 50-tray, 13-ft dia towers, to fractionate a mixture of butanes and butylenes by extractive dist with furfural, was based on lab tests on the desorption of oxygen from water with air, which only resembles extractive dist in that mass transfer in the liq phase is controlling. Details of tests and column operating conditions are given. D. J. S.

1550. Tray design. P. Munk. *Petrol. Refin.*, 1955, **34** (7), 104–8.—A new approach to the design of dist trays is given by means of charts which show the relative effects of vapour and liq flows, as well as of the physical characteristics of the trays themselves. The proposed method has been tested in commercial operation and found satisfactory. A general outline of the development of the method is given and the charts applied to a typical case of an absorber.

The charts and methods have also been successfully applied to modify existing trays and improve their performance. R. L. R.

ABSORPTION AND ADSORPTION

1551. Absorption and stripping design. R. H. Parekh. *Petrol. Refin.*, 1955, **34** (7), 129–36.—A worked example is given for a simplified absorption system, the design basis of which was given in *Petrol. Refin.*, June 1955. The absorption system consists of a primary absorber and re-absorber with an inlet gas rate of 10,000 lb mol at 300 p.s.i.a. and 90° F. Tables of the properties of the absorption oil are given, and the system is designed to absorb 69·5% propane from the inlet feed. By presenting illustrative process design calculations in tables, it is shown how important variables for the above example are evaluated, such as recovery of components as liq in raw feed, lean oil circulation rate, etc. R. L. R.

CRACKING

1552. New cat cracking process solves residuum problems. J. C. Dart, G. A. Mills, A. G. Oblad, and C. C. Peary. *Petrol. Engr*, 1955, **27** (6), C43.—A continuous moving-bed cat cracking process converts crude residua to high quality dist products. The feed, comprising 45–50% of the crude, is fractionated to produce gas, gasoline, No. 2 fuel, heavy gas oil, and bottoms which is consumed as refinery fuel. Heavy recycle gas oil is cracked to extinction. A flow diagram of this Houdresid process is given. The process is economical and well suited to the use of inexpensive natural cat. J. B. S.

1553. Moving-bed processes. R. E. Vener. *Chem. Engng*, 1955, **62** (7), 175.—The points in favour of the use of moving-bed processes are mentioned, and some applications in the petroleum, chemical, and metallurgical industries are given. The use of moving-bed processes as a part of the unit operation of solids–gas contacting is emphasized.

The history of moving-bed processes in the chemical and metallurgical industries is briefly described and the general technique of operation discussed. In the petroleum industry there are several applications developed in the past 25 years, and several cat cracking operations are described in detail.

The basic theory of moving-bed processes is described and the use of the theory of fluid mechanics, heat and mass transfer, kinetics, and chemical equilibrium discussed.

Practical design considerations are outlined. Points discussed include solid feed preparation, solids handling feeders, conveyors and level measurements, reactor designs, and instrumentation. Several methods of feed preparation are mentioned. Current practice in reactor design in several industries is discussed. Lists are given to show in which processes moving-bed contactors could be used, several applications are discussed in detail, and operations that are only on pilot-plant scale are mentioned. D. J. S.

1554. Aromatization processes in the petroleum industry. N. R. Capdevila. *Combustibles (Zaragoza)*, 1955, **77**, 14–29.—Brief description of the following cat processes for aromatization: Atlantic Catforming, Thermofor cat reforming, Hyperforming, Cycloversion, Sinclair–Baker reforming, Ultraforming. Also mentions Sovaforming. Pure aromatics are separated by extractive dist, azeotropic dist, solvent extraction, and adsorption. Separation of aromatic isomers is by fract dist, fract crystallization (*e.g. p*-xylene from *o*- and *m*-xylene). 78 refs. (Cf. Abs. **1218**, 1955.) A. C.

1555. How first ultraformer has performed. R. R. Gunmaer and L. L. Raiford. *Oil Gas J.*, 8.8.55, **54** (14), 119.—A review is given of the results of the ultraformer at Pan-Am Southern's El Dorado, Arkansas, refinery, which has been in operation since May 1954. The unit upgrades a highly paraffin naphtha and has operated at octane levels in excess of 95 research octane, giving higher gasoline yields and higher effective cat activity and yield maintenance. A flow diagram is given. G. A. C.

1556. Slurry recycle and slurry settling. J. W. Moorman. *Oil Gas J.*, 22.8.55, **54** (16), 128.—Method to partially eliminate slurry oil return to the reactor employed by Eastern States Petroleum Co, Shell Oil Co at Houston, and Cities Service Refining Corpn at Lake Charles, consists in using slurry settlers. Complete elimination can be obtained by use of a second stage of cyclones in the reactor, both procedures result in reduced coke yield on feed. G. A. C.

1557. Hydrofining catalytic cracking feed stocks. E. H. Lewis. *Oil Gas J.*, 18.7.55, **54** (11), 95.—Hydrofining appreciably increases cat cracking value of high-sulphur virgin and cracked gas oils, the corrosion problem encountered with high-sulphur stocks being greatly reduced. G. A. C.

1558. Shell upgrades stock by hydrodesulphurization. M. D. Abbott, G. E. Liedholm, and D. H. Sarno. *Oil Gas J.*, 18.7.55, **54** (11), 92.—2 selective vapour-phase hydrodesulphurization plants have been operated by Shell Oil Co for nearly 10 years, employing a tungsten–nickel sulphide cat at pressures from 500 to 750 p.s.i.g. and at temp from 450° to 700° F. The process can be applied to cracked naphthas and to light straight-run intermediates. G. A. C.

1559. Stanlow hydrodesulphurization unit brought on stream. Anon. *Petroleum, Lond.*, 1955, **18** (7), 262.—Lab and pilot plant investigations showed that cost of hydrodesulphuriza-

tion is reduced when amount of recycle gas is decreased. A "trickle" technique using cobalt–molybdenum–alumina cat is employed, and first commercial plant came on stream in April. Over 90% sulphur removal has been obtained when processing light cat-cracked cycle oil at 7000 b.d. J. B. S.

1560. New hydrodesulphurization unit. Anon. *Industr. Chem. Mfr*, 1955, **31**, 351–2.—A description of the new hydrodesulphurizer at Stanlow employing the "Shell" trickle technique. A. C.

POLYMERIZATION

1561. Derivative hydrocarbons. P. W. Sherwood. *Petrol. Engr*, 1955, **27** (6), C13.—These hydrocarbons are synthesized by polymerization of mono-olefins, alkylation, or dehydrogenation. In the first method polymerization of propylene gives the trimer nonene used in nonyl phenols and the tetramer dodecylene which gives rise to dodecyl benzene—a synthetic detergent intermediate. Polylethylene is the most important product of polymerization process. Alkylation gives rise to ethyl benzene—an intermediate in the styrene synthesis. This alkylation is carried out in the liq phase over an $AlCl_3$ cat. Dehydrogenation is employed in the direct conversion of butane to butadiene. J. B. S.

ALKYLATION

1562. Why Cosden chose HF alkylation. A. R. Orr. *Oil Gas J.*, 1.8.55, **54** (13), 92.—The new HF alkylation plant of Cosden Petroleum Co at Big Spring, Texas, runs at over 3000 b.s.d., using mixed feed. Horizontal contactors with mixers are employed, and defluorinators follow the de-*iso*butanizer. The new process eliminates the difficulty of disposing of spent sulphuric acid. G. A. C.

ISOMERIZATION

1563. Petroleum xylenes. Anon. *Oil Gas J.*, 25.7.55, **54** (12), 233.—The separation of xylenes from petroleum and their oxidn are discussed. Fractional crystallization, isomerization, and co-crystallization methods are briefly reviewed. G. A. C.

CHEMICAL AND PHYSICAL REFINING

1564. Regeneration of used oils. F. Sager. *Tekn. Tidskr.*, 1955, **84** (33), 749–54.—The present status of reclaiming and re-refining is described in detail, the term reclaiming being used for the removal of solid particles and water, while the term re-refining is applied to physical, physico-chemical, and chemical means of regeneration. Impurities which can be present in used oils are classed and described, as well as different types of used oils. The regeneration processes described range from single means of filtration to treatment with bleaching earth and re-refining with sulphuric acid combined with skimming-off volatile constituents by steam dist. The analytical procedures used in conjunction with re-refining are enumerated. Finally, the methods of collecting used oils are discussed and a short summary of the economics of re-refining is given. (Author's abstract.)

SPECIAL PROCESSES

1565. Isomerization of mineral oils with hydrogenation catalysts. C. Boelhouwer and H. I. Waterman. *J. Inst. Petrol.*, June 1955, **41** (378), 211.—The paper discusses the possibility of *cis–trans* isomerism of naphthenic mineral oils, and describes some isomerization experiments with hydrogenated Balikpapan and Tarakan lub oils and a medicinal liq paraffin. Prolonged heating of several saturated lub oils of pronounced cyclic character with Ni cat and high-pressure hydrogen (50–200 atm, 250°–300° C) causes remarkable changes in their physical properties, probably due to *cis–trans* isomerism of the naphthenes. The isomerized oils show a small improvement of V.I. 4 literature refs are included. U. M.

1566. Progress in synthetic liquid fuels. Anon. *Chem. Engng*, 1955, **62** (8), 120.—A new process has been developed using the cheapest synthesis gas available. Once through conversions of 97% are claimed, containing 92–98% useful product. The cat is precipitated iron suspended in oil. Details of operating conditions are given. D. J. S.

METERING AND CONTROL

1567. Employing electronic control. Anon. *Chem. Engng*, 1955, **62** (8), 128.—A short article discusses applications of electronic control, giving advantages and showing how it may be applied. D. J. S.

1568. Which type of instrument should you use—electronic or pneumatic? Anon. *Oil Gas J.*, 1.8.55, **54** (13), 106.—The advantages and disadvantages of both types of instruments for controlling refinery processing units are discussed. There is a tendency that the application of electronic instruments will increase. G. A. C.

PRODUCTS

CHEMISTRY AND PHYSICS

1569. The nature and composition of petroleum. V. A. Kalichevsky. *Petrol. Engr*, 1955, **27** (6), C36.—The different nature of crude oils is considered from the point of view of quantity and quality of materials that can be recovered on processing. The chemistry of simple hydrocarbons is discussed to illustrate the diverse and extremely large number of possible combinations of C and H atoms that may exist in a mol. J. B. S.

1570. The electrical conductivity and permittivity of mixtures, with special reference to emulsions of water in fuel oil. C. A. R. Pearce. *Brit. J. appl. Phys.*, 1955, **6** (4), 113–26.—The electrical characteristics of a mixture of 2 substances are dependent only in part on the electrical characteristics of the individual phases. In addition to the volume ratio of the components of the mixture, other factors, such as particle shape and distribution, have important effects on the characteristics. In this connexion an emulsion formed of a liq with a high conductivity in one of low conductivity is free from the complications of many practical mixtures. The droplets are spheres, and the system approaches the case which has been attacked theoretically with the greatest success.

The characteristics of water in fuel oil emulsions have been studied both directly and indirectly by means of an electrolytic analogue. The work has drawn attention to the importance of the size distribution of the dispersed phase and has confirmed the theoretical treatments of Wiener and Bruggeman, at the same time emphasizing the limitations of their formulæ. This has given the work a value in applications outside the narrow field of the specialized emulsions in which it originated. (Author's abstract.)

1571. Chemical engineering fundamentals: interpretation of kinetic data—IV. T. E. Corrigan. *Chem. Engng*, 1955, **62** (7), 227.—The series ends with 2 worked examples based on data collected from a fixed-bed prepilot plant reactor. One is on the most probable mechanism of the reaction and the other on the comparison of calculated and experimental results. D. J. S.

ANALYSIS AND TESTING

1572. Hydrocarbon analysis made more accurate, speedy. W. J. Podbielniak and S. T. Preston. *Petrol. Engr*, 1955, **27** (5), C17–25.—Low-temp fractional dist method normally used for hydrocarbon analysis is subject to a number of errors, the principal one being the use of the dew point for determining the identity of the dist. This can be overcome by the use of thermal conductivity cell. The development of the commercial "Thermocon" unit is described and results of analyses given. J. B. S.

1573. Multiple-viscosity motor oils analysed. E. B. Brien. *Petrol. Engr*, 1955, **27** (5), C45–8.—Research has shown that multi-grade oils make a significant reduction in fuel anti-knock requirements. 3–5 octane numbers can be saved. There is no appreciable effect on deposits formed, but 5–16% fuel saving has been reported. No appreciable difference in wear has been detected. J. B. S.

1574. Gamma-radiation will aid finer oil products. Anon. *Petroleum, Lond.*, 1955, **18** (8), 294.—Standard Oil Development Co at their Esso Research Centre are building a radiation lab to conduct basic research on radiation as a source of energy for bringing about chemical reactions. The centre will explore the use of γ-rays—emitted from radio-active cobalt—for this purpose. J. B. S.

1575. Spectroscopy in the oil industry. Pt II. W. C. Price. *Petroleum. Lond.*, 1955, **18** (7), 258.—The i.r. spectrum is probably the most specific physical characteristic of a substance. Bands associated with vibrations CH, OH, C≡C bonds always occur within certain characteristic wavelength ranges, thus indicating presence of the corresponding group in the sample. Although experimental equipment for Raman spectroscopy is very different, bands in the spectrum are very similar to i.r. bands. Relative advantages of Raman and i.r. method are discussed and Raman instrumentation and the economics of i.r. analysis in a small refinery considered. J. B. S.

1576. Solids concentration. N. Arbiter. *Chem. Engng*, 1955, **62** (8), 164.—The controlling properties of solid mixtures are discussed, and a review is given of separation processes, including hand and mechanical sorting, gravity sorting (relative and absolute), magnetic separation, electrostatic separation, and flotation. A section is also devoted to classification. D. J. S.

CRUDE OIL

1577. Evaluation of Oklahoma and Kansas crude oil. J. G. Huddlestone and R. E. Lindsay. *Petrol. Engr*, 1955, **27** (6), C7.—Properties of various Mid-Continent crudes vary considerably, and their properties and possibilities favour different refined products manufacture. All crudes evaluated are first characterized by Bureau of Mines Hempel distn. Any further analysis is by pilot plant fractionation and subsequent vacuum flashing of the residuum. The results can then be checked against the given inspection data. J. B. S.

ENGINE FUELS

1578. The combustion-efficiency problem of the turbojet at high altitude. W. T. Olson, J. H. Childs, and E. R. Jonash. *Trans. Amer. Soc. mech. Engrs*, July 1955, **77** (5), 605.—Representative results of investigation with turbojet combustors are presented to illustrate the trends obtained with: (1) combustor operating variables; (2) combustor design variables; and (3) fuel variables. The data indicate that as the combustor becomes one of low pressure and low temp at high altitude, low combustion efficiencies and limited values of obtainable temp rise are encountered. The necessary criteria for achieving stability of operation and high combustion efficiency over a wide range of operating conditions, and the design features that aid in establishing these criteria, are established. It was shown that, for a given combustor, fuel injector, and fuel volatility, fuels of higher flame speed and/or lower ignition temp gave higher combustion efficiency at high altitude operating conditions. The paper is illustrated by numerous diagrams and curves, and includes 17 literature refs. U. M.

1579. Volatility of gasolines in relation to vapour-lock. L. Abenza and J. Valls. *Combustibles (Zaragoza)*, 1955, **77**, 3–13.—Previous work relating vapour-locking tendency to RVP and slope of ASTM dist curve is reviewed. Meteorological conditions in 14 regions of Spain show extremes of −18° C in winter to 44° C in summer. Recommended that for winter use in Spain alcohol-free gasolines of 11 lb RVP be used, for spring and autumn 10 lb RVP with a slope on the ASTM dist curve ±0·9° C per % dist at the 10% point, for summer 9 lb RVP in the 2 coolest regions but 8 lb RVP elsewhere, with a similar dist curve slope. Use of alcohol-containing blends requires caution. A. C.

1580. Established motor-fuel vapour-pressure levels. T. W. Legatski and O. C. Bridgeman. *Oil Gas J.*, 22.8.55, **54** (16), 136.—A new method is described to establish the base line of motor-fuel characteristics which an automobile fuel system can tolerate. G. A. C.

GAS OIL AND FUEL OIL

1581. A study of the flow properties of residual fuel oils using electrical conductivity methods. G. C. Ackroyd and A. G. Lowe. *J. Inst. Petrol.*, July 1955, **41** (379), 229.—Visc and electrical resistivity of a Middle East residual fuel oil were determined in low and high fluidity conditions; similar measurements were made on the same oil after a few years storage. It was found that the oil constituents primarily responsible for electrical conduction are the asphaltenes and resins. In an oil in the minimum fluidity condition there is evidence of 2 types of structure: (*a*) apparently due to an interlocking network of wax crystals, and (*b*) due to the presence of asphaltene-resin micelles in some form of association with wax. Oils in the max fluidity condition show little evidence of any structure of this kind. In oils which have developed a structure through storage at ambient temp, it is of type (*b*). 2 literature refs. U. M.

1582. Gasification of heavy fuel oil by the O.C.C.R. process. Anon. *Engineer, Lond.*, 1955, **200**, 108–9.—The "Office Central de Chauffe Rationnelle," an association formed in France by industrialists with the support of public bodies, has developed equipment for gasification of liq fuel by application of primary air and utilization of heat of combustion of some of the products; resulting gas and finely suspended carbon matter then burned with secondary air at furnace. Oil must be preheated to give visc of 100–150 sec Red I, and gasification is essentially cracking, approx 2–4% of oil deposited as coke at base of gasifier, removed every 6–8 hr in a few minutes. *Ca* 30% of carbon in oil is not gasified and is suspended in gas stream. Approx analysis of gas is CO_2 4%, CO 16%, H_2 14%, CH_4 4%, N_2 62%. Temp of gas is 1150°–1250° C and total heating value, including sensible heat and heat in suspended carbon, is 215 B.t.u/ft. Overall thermal efficiency 95–98%. One of the chief advantages claimed is ability to create reducing, neutral or oxidizing atmosphere in furnace, not possible with orthodox atomizing type of oil burner, which requires 15–20% excess air. Attack from high sulphur fuels is claimed to be less than by conventional atomizing. *Ca* 100 O.C.C.R. gasifiers are in operation on the Continent. Photograph and diagrams A. C.

LUBRICANTS

1583. Some physical aspects of lubrication in rolling bearings and gears. W. Lewicki. *Engineer, Lond.*, 1955, **200**, 176–8, 212–15.—In experiments devised to check author's hydro-elastic lubrication theory, unexpected new properties of lub

films in rolling bearings and gears have been revealed. Effective film visc (film thickness order 10^{-4} cm) is related to temp of bounding surfaces by usual temp–visc relation, not related to Hertzian stress (in "flattened out" region between contact surfaces) or lub bath temp. Fluid films have no driving power whatsoever, *i.e.* freely rolling element tends to slide rather than roll. Unless sliding is checked externally, film is much thinner and subject to a disturbance not yet well understood. Similar effect if atmospheric air enters Hertzian zone in form of minute bubbles. Formation of bubbles universal to all liq and only avoided by complete immersion. Even at moderate operating velocity (1 m/sec) mere delivery of enough lub to build up the film is found problematic when there is some air around. (Synopsis of author's summary.) A. C.

1584. Planning of service tests with lubricants. A. T. Wilford. *Petroleum, Lond.*, 1955, **18** (7), 253–5.—These tests for public service vehicles are carried out for the following reasons: to establish compliance with specification, to determine performance of new product, to compare 2 products, or to investigate a complaint from service. Lab tests always precede service tests. Optimum size for fuel consumption tests are 12 experimental and 12 standard vehicles. For effect on engine life *ca* 100 vehicles are used. These tests may take 6 years to complete, and a statistical analysis after a short period enables decisions to be made on suitability. J. B. S.

1585. Trends in early insulation oil specifications. E. A. Evans. *J. Inst. Petrol.*, June 1955, **41** (378), 203.—An historical account of the early work of the Insulating Oil Committee, based on Electrical Research Association papers. U. M.

1586. Engine cleanliness. Anon. *Auto. Engr*, 1955, **45** (7), 307.—The action and effect of detergent motor oils are discussed. T. T.

BITUMEN, ASPHALT, AND TAR

1587. Behaviour of bituminous materials in ultraviolet light. J. Heinrich. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (4), 118–19.—See *Erdöl u. Kohle*, 1954, **7**, 428–33, and *Bitumen, Teere, Asphalte, Peche*, 1954, (16), 4–9. R. T.

1588. Cementing of wood fibre insulating structural plates under parquet and linoleum. K. Voss. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (6), 207–9.—Types of cements and sp applications are discussed. Cementing practice for parquet, linoleum, etc.—as hitherto executed—presents no difficulties. Fibre plates behave like wood. Sp application—supporting plates both to foundation and overlay, or to foundation or overlay only—is a question of laying technique. Bitumen emulsion, bitumen without solvent, or neoprene cements are superior, and choice rests with the operator. R. T.

1589. Crack formation in bitumen coating, *e.g.* poured asphalt. W. Rick. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (6), 210–11.—Cracks result from a notch effect, a continuous alternating stress. Thermoplastics like bitumen are subject to high notch sensitivity in the plastic range, where cohesion is low, unless increased by surface tension. Thin skins collapse as strain systems on stress disturbance, causing notching. This occurs in streets and buildings and roofing paper. R. T.

1590. Influence of heavy vehicle traffic on future street planning. T. Temme. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (6), 196–8.—Present and future constructions are discussed in relation to increasing wt and No. of vehicles. Design inclines to a thick foundation and supporting layers, and the use of frost-resistant material in the under-layers of the street to a frost-free depth. R. T.

1591. Comparison of ageing stability of road tars. H.-G. Franck. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (6), 185–7.—A procedure is described which permits judging the ageing stability of road tars, on the basis of the following 4 factors relative to the soft pitch after setting. Vaporization dependent on anthracene oil boiling above 350° C. Oxidn sensitivity determined by density. Crystallizable constituents as assessed in DIN 1995, by observing the external appearance and determining naphthalene and crude anthracene cont. Soft. pt. should be as low as possible. Results with conclusions are tabulated for 16 tars from different countries. R. T.

1592. New utilization spheres for poured asphalt in road construction considering experience hitherto in its mechanical application. P. Wichert. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (6), 188–91.—Uncertainty on constructive principles—rigid or flexible foundation—for poured asphalt exists. Relative merits of manual and mechanical application are discussed regarding the debated Berlin poured asphalt containing 6·5–8·5% relatively soft bitumen (45°–65° R and B). Contrary to asphalt-fine cement, poured asphalt requires no binder support. Mechanical laying, preparations, and transport are discussed. R. T.

1593. Chromatographic method for the fractionation of asphalt into distinctive groups of components. L. R. Kleinschmidt. *J. Res. Nat. Bur. Stand.*, 1955, **54** (3), 163.—The separation of asphalt into 4 distinctive groups of components using a chromatographic method is described. Fuller's earth is used as the adsorbent, and *n*-pentane, methylene chloride, and M.E.K. are used as selective solvents. The method facilitates the study of the degradation of asphalts in service, and is suitable form any size saples. In the case of samples of from 3 to 6 g complete fractionation takes from 6 to 8 hr—3 hr of which time is required for fractionation of the *n*-pentane soluble components. Diagrams of the fractionation apparatus and the methods are included. C. B.

1594. Contribution to the colloidochemical analysis of coal tar. Pt II. H. Mallison. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (6), 195.—Filtration of the pulverulent or resinous ppts in tar extraction with selective solvents, on a glass-powder filter, avoids action on the filter and inconsistent results. R. T.

1595. Gilsonite, properties, occurrence, and use. F. J. Heinrich. *Bitumen, Teere, Asphalte, Peche*, 1955, **6** (8), 202–3.—Occurrence, properties, and uses of Gilsonite are discussed. Properties are compared graphically with those of other bitumens. Properties of the coking dist and fractions from Gilsonite and oil shale are tabulated. 16 literature refs. R. T.

SPECIAL HYDROCARBON PRODUCTS

1596. Production of butadiene in the American synthetic rubber programme. Anon. *Industr. Chem. Mfr*, 1955, **31**, 327–34.—Detailed information on the methods used for producing butadiene for American wartime synthetic rubber programme. 362,000 tons butadiene produced from alcohol in 1944 (peak year), equal to 64% of all butadiene used for GR–S rubber in that year. Butadiene from alcohol plants progressively shut down after 1945. Petroleum butadiene plants used 3 routes: (1) direct cracking of naphtha; (2) dehydrogenation of butene; (3) dehydrogenation of *n*-butane. 21 plants with total butadiene rated output of *ca* 430,000 tons were operating in 1944. Main purification process for butadiene was extractive dist with aq furfural. All Government plants were disposed of to private industry in April 1955. Sale price realized ~¼ of original wartime expenditure. Details of individual plants, owners, and disposal figures are given. A. C.

DERIVED CHEMICAL PRODUCTS

1597. Petroleum chemical processes. Pt II. Production of hydrogen from petroleum sources. P. W. Sherwood. *Petroleum, Lond.*, 1955, **18** (8), 296.—Usual route from hydrocarbons to hydrogen is via synthesis gas. This can be either by direct oxidn or steam reforming of the hydrocarbon feed. Considerable amounts of CO are formed in both cases, but can

be removed by the water-gas shift reaction. Synthesis gas is often a by-product from some other operation, *e.g.* acetylene production. Detailed description of commercial processes is given, and methods for purification of hydrogen are described. J. B. S.

1598. Equilibrium dew points in natural gas–glycol systems. L. D. Polderman. *Oil Gas J.*, 25.7.55, **54** (12), 198.—Data obtained in the lab indicate that diethylene and triethylene glycol at 99·5% concn are capable or providing dew-point depressions in the 75°–105° F range. G. A. C.

1599. Canada's only polythene plant. C. H. Hantha and M. Valois. *Petrol. Engr*, 1955, **27** (6), C22.—Plant has a design capacity of 25,000,000 lb/year. The ethylene used is produced by gas phase pyrolysis of ethane. Acetylene is removed in a Girdler unit, and the ethylene, after scrubbing to remove CO_2, and drying is compressed and cooled. Polymerization is carried out at over 20,000 p.s.i. using a free radical releasing agent as cat. The water-like polythene is bled off continuously and extruded. Blending is carried out in Banbury mixers. J. B. S.

1600. Direct oxidation of ethylene to ethylene oxide. R. Landen. *Petrol. Engr*, 1955, **27** (5), C71–5.—Ethylene oxide can be produced more economically by direct oxidn than by the chlorohydrin process. The process is still being developed, and the various factors—air or oxygen, fixed or fluidized beds, etc.—which affect yield and quality are all considered. J. B. S.

COAL, SHALE, AND PEAT

1601. Determination of the nitrogen content of kerogen rocks. M. Kaucic-Somogy and F. Sef. *Nafta (Yugoslavia)*, 1955, **6** (5), 143–50.— ⁼ selecting a suitable process and equipment for the large-scale treatment of oil shales it is important to know their nitrogen content with a particular view to a possible utilization of the ammonia formed during pyrolysis, and because of the influence of nitrogen cpds on the properties of the resulting shale oil. Difficulties in determining the total nitrogen content of oil shales, raw shale oil, and other similar material, owing to the presence of cpds containing the pyridine ring, have been repeatedly referred to in the literature. Both the Kjeldahl and Dumas methods have been used for this purpose, but apparently contradictory views have been expressed as to which of these 2 methods was capable of yielding more reliable results. In the present paper the semimicro procedure of Mapstone's modification of the Kjeldahl method was compared with the Dumas semimicro method. In the first case the apparatus of Parnas and Wagner was used, while in the latter case an apparatus was built according to Gatterman and the DIN standard No. 51726. By checking these 2 methods with acetanilide and nicotinic acid it has been found that both methods are within ±2% of relative accuracy. With the Kjeldahl method the deviation from the actual value has a negative sign with a max of 1·7%, whereas with the Dumas method negative and positive values are obtained in succession with a max of +0·9% and −7·1% resp. The mean value of results obtained by analysing several samples of oil shale from Aleksinac by the Kjeldahl method (0·775 wt %, resp 0·490 wt % of N) was lower by 0·5% than the mean value of results obtained by the Dumas method (0·778 wt %, resp 0·493 wt % N). With the first method 3 results out of a total of 12 exceeded the max allowable relative error of ±2·0% (−3·2%, +4·1%, and −6·1%), while with the Dumas method this limit was exceeded only by one result (−2·6%). The absolute deviations from mean values for results exceeding the established allowable limit amounted to −0·025, +0·02, and 0·003 wt % N, resp −0·013 wt % with the Dumas method. With the Dumas method a higher percentage of satisfactory results has been obtained, and in view of its greater simplicity this method has been selected for the determination of nitrogen in kerogen rocks. (Authors' abstract.)

MISCELLANEOUS PRODUCTS

1602. Review of plastics developments in 1953–54. F. J. McGarry. *Mech. Engng, N.Y.*, 1955, **77** (4), 318.—Subjects covered include new synthetic materials, properties of plastics, fabrication methods, engineering applications, composite materials, and coatings and adhesives. 127 refs. T. T.

1603. Chemical resistance of plastics. E. Bauman. *Nafta (Yugoslavia)*, 1955, **6** (4), 119–24.—The chemical resistance of PVC materials furidur D-102 and furidur D-112 was investigated against the influence of various chemicals. The method used enables one to obtain accurate results which can be used in choosing materials for particular industrial applications. The results for a number of chemicals of various concn are shown in tables. (Author's abstract.)

1604. Plastics in perspective. G. Barsley. *Petrol. Engr*, 1955, **27** (5), C37–44.—The nature of plastics in use today, the influence of their properties on use, and their position in industry today is discussed. Methods of fabrication, and petroleum as a raw material, are considered, as are various plasticizers, etc. J. B. S.

CORROSION

1605. Corrosion in the petroleum industry. Pt II. F. H. Garner and A. R. Hale. *Corrosion Tech.*, 1955, **2** (6), 177.—Various alloys can be used to reduce corrosion in condensing equipment, and for chemical control of corrosion, the pH can be raised to *ca* 6·3 by addition of caustic soda and further increased to 7·5–8·0 by ammonia injection.

In cat cracking plants, corrosion and erosion at high temp can be kept down by using iron alloys containing up to 25% chromium and 12% nickel for reactors and coating regenerators with refractory aggregate liners.

Sulphuric acid is extensively used in refinery operations for chemical treatment of products and as a cat in various processes. For concn above 75% acid, mild steel can be used for vessels and tanks, but for more dilute acid, lead is used for lining tanks and pipelines. W. W. G.

1606. Decreasing cooling water corrosion. H. L. Kahler and C. George. *Petrol. Refin.*, 1955, **34** (7), 144–8.—A new approach to corrosion prevention in water systems utilizing modifications of the dianodic method. This employs 2 anodic inhibitors—phosphate and chromate—in controlled ratio and under controlled pH conditions to eliminate the pitting tendencies encountered with the separate use of either phosphate or chromate. The use of soluble zinc to supplement the dianodic method is also described, and has been shown to be a versatile and effective material, although to be useful zinc must be used with chromate and phosphate, since alone it possesses little power for corrosion inhibition; also the use of phosphate and zinc without chromate has not proved really satisfactory. R. L. R.

1607. Protection of underground pipelines. J. E. Carriere. *Fluid Handl.*, 1955, 253–6.—Report to International Water Supply Congress covers soil investigation, corrosion resistance of pipe materials, including asbestos-cement, wrapping and coating materials, and their penetration by plant roots, and short description of cathodic protection. B. S. W.

1608. When reformer piping failed. F. L. Resen. *Oil Gas J.*, 8.8.55, **54** (14), 98.—The fixed-bed Hydroformer at the Baytown refinery of Humble Oil and Refinery Co caused special problems with materials in recycle-gas service and with carbon-steel tubes in the waste heat boiler, failures occurring due to cracks in welds, etc. Replacement tubes were of 1¼% Cr, ½% Mo steel. G. A. C.

ENGINES AND AUTOMOTIVE EQUIPMENT

1609. Water injection curbs engine detonation. F. R. Cramer. *Oil Gas J.*, 1.8.55, **54** (13), 92.—Tests on a 1650-h.p. engine at the Blythe compressor station of the Southern Counties Gas Co of California are reported and show that water injected in the form of fine droplets into the scavenging air system prevents detonation and raises overall efficiency. G. A. C.

1610. Exhaust gas analysis. The application of an iodine pentoxide method in petrol engine research. A. L. Wachal. *Auto. Engr*, 1955, **45** (7), 295.—The use of iodine pentoxide with sulphuric acid in a modified Orsat apparatus is described. Details are given of a continuous recorder, in which dry iodine pentoxide is used as a reagent. 14 refs. T. T.

SAFETY PRECAUTIONS

1611. Industrial hygiene in the handling of aliphatic petroleum chemical monomers. W. Schweisheimer. *Petroleum, Lond.*, 1955, **18** (8), 291.—Acrylonitrile is probably converted to poisonous cyanide in the body and hence handling requires special precautions. Safe vapour concn and handling precautions are outlined and first-aid treatment described. Hazards encountered in the handling of vinylidene chloride monomer due to its flammable and explosive nature when stored without an inhibitor are described and the health hazard is also considered. J. B. S.

MISCELLANEOUS

1612. Applicational research in the oil industry. C. G. Williams. *J. Inst. Petrol.*, June 1955, **41** (378), 192.—Factors affecting expenditure on research; "types" of research (pure, applied, process, applicational, etc.); product performance criteria dominating most applicational studies; other objectives of applicational research (maintenance of product quality, improved use of products, development of markets for new products, etc.); development of lab testing techniques; organization of applicational research. Discussion on the paper is included. U. M.

1613. The petroleum industry and the D.S.I.R. Anon. *Oil Gas J.*, 5.8.55, **159** (1513), 822.—The annual report of the D.S.I.R. to Sept. 1954 is reviewed, and subjects dealt with include vaporizing liq extinguishing agents, water sprays, and injected foam flow properties of fuel oils, geological survey in Great Britain, ship-launching greases, and the work of various research associations, including M.I.R.A. and the Coal Tar Research Association. G. A. C.

1614. How to determine gas-production costs. E. E. Hunter. *Oil Gas J.*, 25.7.55, **54** (12), 219.—Humble Oil and Refinery Co have developed an energy-content method for allocating gas-production costs. Direct, indirect, and exploration costs can be determined by the method, the limitations of which are given. G. A. C.

1615. Oil firing in central power stations. P. B. Silk. *Petrol. Times*, 19.8.55, **59** (1514), 865.—Fuel consumption for power generation in the U.K. is reviewed, and plans for substituting oil for coal in the electricity power stations are outlined. Design of new boilers and conversion of existing ones for oil fuel are dealt with, together with considerations of the oil burners themselves. Economics of oil and coal firing are briefly discussed. G. A. C.

1616. Fuel and power resources of Germany and their utilization. W. Gumz. *J. Inst. Fuel*, Aug. 1955, **28** (175), 393.—A comprehensive account of the fuel and power position in W. Germany. 95% of W. Germany's energy supply is from coal and brown coal; wood, crude oil, and hydro-electric power make only a small contribution. A table is included which shows the energy balance in 1953. A breakdown is made of energy consumption according to main groups of consumers. There is a general trend towards use of secondary fuels, *e.g.* coke, gas, and electricity. There are 33 literature refs and a 5-page discussion. D. K.

1617. Crude production, throughput and consumption. Anon. *Petrol. Times*, 19.8.55, **59** (1514), 867.—A preliminary study given based on monthly bulletins of petroleum statistics for the oil world in 1954. Production, refining, and transport are dealt with. G. A. C.

1618. Refiners will have coke to burn. G. Weber. *Oil Gas J.*, 8.8.55, **54** (14), 62.—Increased coking capacity in the U.S.A. may mean a surplus of coke on the market. The uses of coke are outlined, and future trends indicated. A table shows existing coke plants and plants under construction in N. America. G. A. C.

BOOK REVIEW

Hilfsbuch für Mineralöltechniker. Zweiter Band. A. F. Orlicek and H. Pöll. Wien; Springer-Verlag, 1955. Pp. x + 332 + 187 plates.

With this, the second volume, under the title "Grundlagen und Grundoperationen der Mineralölverarbeitung" by Orlicek, Pöll, and H. Walenda, this manual is concluded. The first volume gave the properties of crude oils, petroleum products, and their hydrocarbon constituents, and this volume goes on to consider refinery technology in detail.

The book displays in the highest degree a true perception of what the petroleum technologist needs in practice. The subject matter is well arranged and easy to find, and when found it is always helpful. There is also at the end of the book a large number (187 in all) of full page size graphs, beautifully produced and indexed, giving basic data for almost every practical inquiry, such as pressure drops, heat transfer, properties of steam, absorption and rectification, and performance data of common processes. This novel feature will be welcomed by many refiners.

Basic thermodynamics are reviewed and the next chapters explain the flow of fluids, heat and mass transfer, and fractional distillation. Then follow chapters on basic refinery processes, and then a most useful section on basic equipment, furnaces, pumps, compressors, production of cold, and corrosion. Explanations are always clear, emphasis is on how things are done rather than why, as is proper to a practical manual; and suggested references for more detailed study are given at the end of each section. The book is excellently produced and the page size 8 × 11½ inches allows the final section of graphs to be made easily readable. The authors have kept the title of the book in mind and admirably fulfil the expectations of the reader. This volume is recommended to all who practise in design, operation, or technology of petroleum refinery plant.

D. P. P.

CORRIGENDUM

We apologize for an unfortunate error in the last paragraph of the review of Levorsen's "Geology of Petroleum" on page 135A of the September *Journal*. The words "exact science like oil exploration" should of course have read "inexact science like oil exploration."

ADDITIONS TO THE LIBRARY

Autohydrogenation of Oil Gases. H. A. Dirksen, H. R. Linden, and E. S. Pettyjohn. Institute of Gas Technology Research Bulletin 25. Chicago, Ill.: The Institute, 1955. Pp. 75. $5.00.

Results are given of a study sponsored by the American Gas Association and carried out at the Institute of Gas Technology to demonstrate the improvement which autohydrogenation would show in making high-b.t.u. oil gases suitable as substitutes for natural gas. The report covers influence of catalyst type, operating conditions, feed gas composition, and purification techniques, on the conversion of olefins and diolefins in typical oil gases to paraffins, using the hydrogen in the gas.

International Petroleum Register 1955. New York: Mona Palmer, 1955. Pp. 518.

This 32nd edition of the "International Petroleum Register" has been rearranged in comparison with the previous editions. The oil companies of the world are now listed alphabetically, and subsidiary lists are given geographically regarding oil producers, refining companies, natural gasoline companies, etc. In each of these subsidiary lists the name of the operating company is given as an indication that the full details will be found in the alphabetical list. A useful list of trade associations and government bureaux is appended.

Chemical Process Principles. Part I—Material and Energy Balances. Olaf A. Hougen, Kenneth M. Watson, and Roland A. Ragatz. 2nd Edition. New York: John Wiley & Sons Inc., London: Chapman & Hall Ltd., 1954. Pp. 504 + xxxv.

. This Part I of "Chemical Process Principles" concentrates on the chemical and physical problems of processes without overlapping into the fields of unit operations and equipment design. It deals primarily with the applications of general physico-chemistry, thermophysics, thermochemistry, and the first law of thermodynamics and generalized principles have been integrated into procedures for process design and analysis. A new feature of this edition is the inclusion of the latest chemical and physical constants in various tables and the addition of a new chapter on mathematical procedures. New correlations of physical constants are given and modern terminology is employed throughout. The two other parts of this series deal respectively with thermodynamics and kinetics and catalysis, and it is suggested that where the book is used for college instruction in chemical engineering the material of the first part is suitable for second and third year undergraduates. The second part should be suitable for third and fourth year students and the third part for senior and graduate studies.

Financial Analysis for the Petroleum Industry for 1954. Frederick G. Coqueron. New York: Chase Manhattan Bank, 1955. Pp. 40.

Symposium on Diesel Fuels. Philadelphia: ASTM, 1945. Pp. 50.

Symposium on Odor. Philadelphia: ASTM, 1954. Pp. 81.

ABSTRACTS AUTHOR INDEX

The figures refer to Abstracts numbers

Abbott, M. D., 1558
Abenza, L., 1579
Abraham, E. D., 702
Ackermann, —, 83
Ackroyd, G. C., 1581
Adam, H. D., 613
Adams, E., 338
Adcock, C. M., 329
Ahlers, N. H. E., 117
Akers, W. W., 558, 807–8
Albert, A., 1449
Albert, F., 322, 1293
Aldridge, C., 918
Alexander, C., 64
Alexander, L. G., 405
Alexanian, C. L., 1029
Allen, B. W., 296
Alles, M., 1342
Allied Chemical and Dye Corpn, 78
Altorfer, H. A., 357
Ambrose, T. D., 462
Amick, E. H., 372
Amsden, T. W., 761
Amstutz, R. W., 1049
Anderson, E. D., 186
Anderson, T. H., Jr., 1535
Andrault, J., 565
Andrews, H., 75
Andrichuk, J. M., 650
Angerbrandt, F. M., 310
Apostolescu, V., 894
Arbiter, N., 1576
Argo, W. B., 185
Arich, G., 1453
Arkhangel'skii, V. A., 538
Armentrout, A. L., 39
Armstrong, T. A., 134
Arndt, —, 198
Arnold, M. H. M., 882
Aronofsky, J. S., 32, 149
Arps, J. J., 30
Artozoul, J., 1347
Askey, W. E., 407
Atkinson, R. G., 64
Atlantic Refining Co, 71
Atlas Powder Co., 264
Atwood, J. S., 218
Austin, R. J., 391

BASF AG., 77, 191, 209–10, 218, 238, 254, 264
Baccaredda, M., 829
Bacon, N. P., 558
Badger, W. L., 1217
Baeder, D. L., 816
Baibakov, N. K., 1301
Bailey, J. M., 515
Baillie, A. D., 1511
Baird, R. C., 785
Baistrocchi, R., 835
Baker, E. R., 254
Baker, O., 1191
Baker Oil Tools Inc., 28
Baker, R. C., 28
Balaceanu, J. C., 967
Baldacci, R., 867–8
Balekjian, G., 224, 556
Balka, W. H., 1219
Ballard, E. C., 993
Banerjea, S. K., 1465
Banks, G. L., 88
Bannmann, G. P., 570
Banner, E. H. W., 573, 819, 961, 1091–2
Banta, N. S., 1010
Bar, —, 210
Baral, L. L., 76
Bardtke, H., 1047
Barker, K., 464
Barnard, G. P., 1333
Barnes, B. E., 360
Barnes, H., S, 642
Barnes, K. B., 542
Barnes, R. S., 482
Barnwell, G. F., 29
Barret, J. P., 514, 1147, 1368
Barsley, G., 1604
Barson, N., 199
Bart, J. C., 411
Bartholeme, —, 238
Bashkirov, A. N., 572
Bates, C. C., 302
Bates, S., 1494
Batti, P., 828
Bauman, E., 1603
Baumann, G. P., 82
Bayerlein, —, 81, 213
Beard, L. C., 251
Bearden, W. G., 321
Beaubien, S. J., 252
Beaumont, F. N., 756
Beck, G., 230
Beck, K-G., 453
Becker, W., 597
Beckman, R. B., 197
Bell, E. R., 254
Bellah, J. S., 232
Beltrame, F., 1189
Bender, M. J., 205
Bender, R. O., 987
Benjamin, E. C., 1017
Bennett, H. H., 1150
Bennett, J. F., 1101
Benning, A., 1138, 1231
Benz, G. R., 1115
Berg, —, 218
Berg, C., 410, 704
Berg, C. H. O., 64, 69, 76, 218
Berger, M., 928
Berger, Y., 1290
Bergman, D. J., 64
Bergman, S. A., 1195
Bergmann, G., 115
Bergstrom, E. V., 76
Bergstrom, F. S., 28
Bergwerks-AG., 270
Bergwerksverband zur Verwertung von Schutzrechten der Kohlentech. G.m.b.H., 213
Berkeley, F. D., 388
Bernelin, B., 1348
Berry, V. J., 774
Berti, V., 201, 871, 1233
Bertolette, W de B., 987
Bertolini, F., 190
Bertuzzi, A. F., 150
Betteridge, W., 1505
Beyer, G. H., 194, 199
Bhatnagar, S. S., 1432
Bidwell, J. B., 1484
Bielak, E. B., 89, 581
Bills, J. L., 76
Binger, W. W., 694
Bischoff G.m.b.H., Gottfried, 202
Biske, V., 1025
Bisschop, M. C., 1447
Blakey, B. C., 437
Bland, W. F., 755
Blinov, V. I., 1234
Bloch, H. S., 861
Blomen, —, 81
Blomerth, E. A., 1283
Bocchi, A., 584
Böchler, —, 524
Bluschke, H., 84
Böcholt, —, 258
Böcker, A., 51
Boekman, T. V., 1439
Boelhouwer, C., 1565
Böhme Fettchemie G.m.b.H., 265
Bollman, G. H., 516
Bombara, G., 873, 875, 1251
Bonilla, M. G., 647
Bonn, —, 112
Boon, E. F., 1542–3
Booth, W. M., 310
Boranic, V., 788
Borelli, T., 814
Borowski, J., 1306
Boultbee, A. H., 946
Bouman, C. A., 31
Bourgeois, E., 980
Bowden, A. T., 617
Bowden, F. P., 826
Bowden, S. T., 228
Bowler, V. O., 1537
Boyd, C. W., 1205
Boyd, D. M., 68, 425
Boyd, J. T., 860
Bozeman, J. F., 164
Braae, B., 415
Brachetti, E. B., 607
Bradford, B. W., 1106
Braendle, R. O., 1485
Brandel, A. J., 81
Brannen, C. G., 247
Brannon, H. R., 125
Brasunas, A. de S., 1157
Bratzler, K., 585
Brauer, W., 28
Breitung, C. A., 1300
Brennan, G. L., 53
Bridgeman, O. C., 1329, 1580
Brien, E. B., 366, 506, 1087, 1573
Brison, R. J., 1532
Broaddus, J. E., 1072
Brock, J. A., 949
Brockwell, P. A., 730
Brodskii, A. M., 1213
Broecker, J. B., 1131
Broeze, J. J., 91, 1459
Brons, F., 324
Brook, M., 742
Brooke, M., 384
Brooks, B. T., 506
Brooks, T. P., 1425
Brooks, W. B., 513, 557, 1230
Brown, C. C., 28
Brown, G. G., 1522
Brown, J. K., 869
Brown, J. W., 218
Brown, L. S., 378
Browne, W. H., 667
Browning, W. C., 1429
Bruins, P. F., 1132
Brundred, L. L., 1183
Brüninghaus, L., 1436
Brunner, M., 1476
Brunstrum, L. C., 247
Brusset, H., 586
Bryant, C. M., 153
Büchner, —, 112, 198, 213
Bucholz, H. H., 497
Buck, B. O., 931
Buckles, G. L., 1050
Bukowiecki, A., 98
Bullock, H. C., 1532
Bundrant, C. O., 667
Burgoyne, J. H., 593
Burke, W. F., 369
Burlet, R., 900
Burner Manufacturers Association, 240
Burnside, H. E. W., 218
Burrows, D. B., 151
Butler, R. M., 1540
Buttin, R., 1405
Buzon, J., 1337

Cafcas, T. H., 482
Calderwood, G. E. N., 581
Caldwell, B. M., 773
Calhoun, J. C., 1185
California Research Corpn, 81, 276
Callaway, F. H., 165
Cameron, A., 475
Campbell, D. L., 606
Campbell, J. L. P., 1046
Campbell, J. M., 459
Cannon, R. S., 1439
Canzler, —, 218
Capdevila, N. R., 1218, 1554
Carmine, C. C., 1077
Caron, J. B. R., 241
Carozzi, A., 1413
Carr, N. L., 151
Carrier, J. E., 1607
Carsola, A. J., 12–13
Carter, C. F., 1455
Cary, J. R., 387
Case, G. H., 1008
Casu, B., 871
Cataldi, M. A., 273
Cattaneo, A. G., 252
Caudle, B. H., 1427
Cauley, J. E., 192
Celanese Corpn of America, 254
Cerrone, M., 1003
Chahveilkilian, E., 586
Chajec, W., 1202
Chalk, A. J., 88
Chalkley, D. E., 1106
Chalmers, J. M., 1532
Chamberlain, C. A., 516
Chancellor, J. N., 1066
Chapman, A. H., 1257
Chapman, J. R., 1260
Charnuil, I. A., 38, 1179
Chartener, W. H., 760
Chaumet, P., 322
Chem. Fabr. Badenia Keilmann OHG., 110
Chem. Verwertungsges Oberhausen m.b.H., 218
Chem. Werke Bergkamen AG., 83
Chem. Werke Huls AG., 198, 209
Chenicek, J. A., 154
Childs, J. H., 1578
Chu, J. C., 1076
Cier, H. E., 218
Cizmic, N., 26, 1419
Clare, H., 465
Clark, G. H., 282, 528, 596
Clark, R. C., 22
Clark, W. G., 935, 1547
Clarke, E. W., 71
Claussnitzer, J., 1245
Clay, T. W., 369
Cloud, P. E., Jr., 1389
Coenen, C. B., 725
Coffer, H. F., 22
Coghlan, C. A., 218
Cogliano, J. A., 1463
Cohen, R. M., 194
Cole, J. A., 108, 1239
Collin, F. J., 69, 81, 213
Collins, A., 57
Collins, R. E., 320
Comley, E. M., 215
Condon, M. A., 658
Conison, J., 1539
Conlan, P. B., 933
Conlan, R. B., 929
Conley, J. P., 264
Conn, A. L., 74
Connor, J. E., 803
Continental Oil Co, 254
Coogan, F. J., 391
Cook, F. E., 1376–7
Cook, H. D., 1098
Cooke, D. Y., 768
Coppa-Zuccari, G., 494
Corbett, P. F., 464
Corlay, W. T., 1061
Cornell, D., 793, 1177, 1422, 1526
Cornell, P. W., 569
Corrigan, T. E., 427, 708–9, 965, 1096–7, 1225, 1319, 1571
Costa, D., 828
Costantinides, G., 841–2, 1453
Courtel, R., 1342, 1348
Coussemant, F., 578, 825
Cowling, J. E., 175
Cox, H. R., 617
Cox, S. R., 1069
Craig, F. F., 1045
Craig, R. G., 952
Cramer, F. B., 1609
Crantz, R., 490
Crawford, P. B., 320, 1180, 1294
Cree, J. C., 853
Crews, S. H., 297
Crico, A., 373, 943
Criddle, D. W., 485
Croes, G. A., 1178
Crosby, E. S., 391
Cross, S. T., 264
Crowley, D. J., 226
Croy, —, 110
Crozier, A., 1326
Cumming, A. P. C., 1325
Cundelan, J. V., 1017
Cunningham, L. J., 1194

Dahmer, K., 600
Daimler, —, 110
Dalla Lana, I., 431
Danforth, J. D., 205
Daniels, —, 238
Danulat, —, 213
Dappies, E. C., 1397
Darling, S. M., 239
Dart, J. C., 1211, 1552
Davie, F. W., 272
Davies, A. W., 614
Davies, R., 1482
Davis, P. C., 150
Davison Chemical Corpn, 76
Davtyan, N. A., 608
Dawson, J. E., 88
Dazzi, J., 265
Dean, L. E., 408
Dean, R. R., 395
Deanesley, R. M., 76
De Ardo, A. K., 734
Debyser, J., 284
Decker, W. H., 1441
Dedman, S. W., 407
Deering, R. G., 44, 59, 1525
de Graaf, J. E., 94
de Hey, —, 1207
Dehlinger, P., 667
Dehydag Deutsche Hydrierwerke G.m.b.H., 258
Deile, L., 446
de Lachaux, P., 791
Delaporte, A. V., 817
del Grande, R., 1003

Dempsey, B. J., 1473
Denker, —, 235
Dent, F. J., 827
Depowski, S., 806, 1279
de Pree, D. O., 239
de Rosset, A. J., 218
Deterding, J. H., 451
Deutsche Erdöl AG., 202
Deutsche Gold- und Silber-Schiedeanstalt, 95
Deutsches Hydrierwerk Rodleben VEB, 198
Deutsche Shell AG., 264
de Verter, P. L., 1382
de Voe, W. F., 1115
Dewees, E. J., 668
DeWitt, T. W., 1454
de Witte, L., 24, 1378, 1516
Dickey, P. A., 10, 645
Dickie, R. K., 329
Dickinson, N. L., 218
Dierichs, —, 112
Dietsch, C., 501
Dillon, C. P., 1216
Dinerstein, R. A., 81
Dinkloh, E., 1358
Disney, R. W., 289
Distillers Co, 218
Doble, F. C., 261
Dockendorft, R. L., 821
Doll, R., 860
Domask, W. G., 1221
Donahue, R. W., 1464
Donnelly, H. G., 222
Doolittle, A. K., 227
Dorschner, —, 209, 238
Dougherty, P. F., 924
Douglas Aircraft Co, 254
Dow Chemical Co, 218
Downing, J. A., 168
Dravnieks, A., 273
Dreher, J. L., 1455
Drinkwater, J. W., 455, 590
Drzewiecki, J., 522
Dubis, W., 912
Duce, J. T., 1257
Duff, B. S., 1136
Duff, D. M., 139, 332, 1054
Duggan, M., 1503
Dummett, G. A., 394, 797
Dunham, R. J., 762
Dunning, H. N., 225, 326
du Pont de Nemours and Co, E. I., 265
Dupouy-Camet, J., 346
Durandet, J., 1226, 1441
Duren, G. W., 931
Durning, H. N., 237
D'Yakova, M. K., 608
Dyes, A. B., 162
Dyson, A., 451

Earlougher, R. C., 1049
Early, J. V., 75
Eaton, C. D., 391
Eby, L. T., 436
Eddi, R., 1465
Edeleanu-Ges m.b.H., 202
Eden, T. F., 1156
Edwards, J. L., 1016
Edwards, J. M., 670
Egloff, G., 280, 412, 505, 622, 1084
Elche, —, 258
Eisenwerke Gelsenkirchen, 258
Elgie, W. G., 1198
Elledge, L. R., 1532
Elledge, E. G., 483, 1481, 1490–1
Ellis, S. R. M., 234
Elteton, G. C., 722, 1090
Elyash, L. J., 1454
Emerson, B. W., 771
Enault, Y., 260
Engelhardt, —, 77
Enright, R. J., 163, 903, 1160
Erchak, M., 78
Erickson, R. A., 1427
Erickson, R. L., 624
Ertle, H. J., 1030
Esso AG., 202
Ethyl Corpn, 239
Eugene, F., 1493
Evans, D. J., 1146
Evans, E. A., 1585
Evans, J. C., 978
Everest, T. F., 477
Everett, R., 292
Ewers, J., 1141
Eyth, W. S., 1079

Faber, R. L., 1079
Fagegaltier, R., 1458
Fancher, G. H., 1262
Fabwerke Hoechst AG., 110, 112
Farrar, G. L., 1370
Farrington, B. B., 1466
Fast, L. J., 1255
Fate, D. R., 776
Favre, J., 973, 1337, 1347
Felts, W. M., 9, 640
Fenske, M. R., 1475
Fentress, C. H., 769
Ferrell, R. D., 1220
Fetterly, L. C., 1221
Field, E., 218
Filak, G. A., 1232, 1331
Filatova, E. D., 1213
Finch, H. de V., 218
Findlay, R. A., 68
Findlay, R. H., 64
Fisher, D. W., 649
Fiske, C. E., 1534
Flagg, A. H., 1046
Flamand, M., 1470
Flaxbart, E. W., 186
Fleming, C. L., 982
Fleming, J. F., 196
Flesch, —, 238
Flister, E., 1356
Flood, J. E., 1532
Fontana, F. J., 81
Fontenot, J. B., 697
Forbath, T. B., 729
Forgotson, J. M., Jr., 635
Forrester, J. H., 74
Forster, E. O., 248
Forteas, F., 254
Fortier, Y. O., 654
Foster, A. L., 386, 848, 950
Fouche, R., 963
Foulkes, G. E., 52
Fourtel, R., 854
Fowler, F. C., 719
Foxwell, G. E., 1160
Franck, H-G., 1004, 1357, 1591
Fred, M., 594
Frederick, S. H., 1156
Free, —, 77
Freshwater, D. C., 396, 399, 419, 421
Frey, R. M., 1131
Friedman, B. S., 804
Frink, J. W., 648
Fritts, H. W., 694
Frye, C. G., 218
Fuchs, W., 974
Füchtbauer, H., 1409
Fühs, R. C., 1443
Fuller, D. D., 1479
Fuller, M., 1495
Furby, N. W., 1122
Furman, K. E., 218
Futterer, —, 191

Gable, G. M., 68
Galegar, W. C., 583
Gallaway, B. M., 1324
Gallitelli, P., 1414
Galovic, S., 681
Gamuiczynski, J., 144, 1288
Garbo, P. W., 218
Gardiner, W. L., 670, 1201
Gardner, F. J., 129, 170, 293, 334, 636, 679, 1036, 1164, 1263, 1265–6, 1402–3
Garlick, J. M., 675
Garner, F. H., 512, 611, 740, 872, 1502, 1605
Garner, F. R., 214
Garst, A. W., 666
Garthwaite, D. L., 1176
Garvin, W. W., 159
Gasparotti, F., 835
Gasquet, R., 926
Gassaway, J. S., 28
Gates, C. F., 1522
Gatti, E., 846
Gaye, F. L., 770
Geelen, H., 1229
Geffen, T. M., 774, 1045
Geiser, N., 218
Gellert, —, 218
Gelsenkirchener Bergwerks AG., 110, 258
Gemassmer, —, 218
Gentry, R. M., 977
George, C., 1606
Georgi, C. W., 471
Gerault, M. A., 1501
Gery, W. B., 1532
Ghublikian, J. R., 206
Gianni, F., 1251
Gibbon, A., 299
Gibinski, S., 409
Gibson, R. P., 1274
Gilbert, E. E., 216
Gillet, A., 1250
Gilliland, R., 425
Girelli, A., 448, 1451
Gjurdevic, D., 102
Gladel, Y. L., 1226, 1326, 1441
Gladfelter, R. E., 165, 1299
Gladkikh, M. A., 509
Gleason, A. H., 78
Gleim, W. K. T., 81
Glendenning, E. B., 241
Glogoczowski, J. J., 141, 307, 1335
Goalwin, D. S., 713
Godfrey, D., 515
Goebel, E. D., 1166
Goering, H. G., 78
Goffredo, L., 1338
Göggel, —, 191
Göhre, —, 77
Goodger, E. M., 986
Goymann, —, 83
Gore, T. L., 150
Gough, R. H., 559
Govier, G. W., 431
Graf, —, 112
Graffney, B. J., 729
Graham, H., 1495
Grahl, E. R., 698
Granet, I., 966
Grant, L. F., 6, 639
Graziani, F., 1441
Greenfeld, S. H., 256–7
Greenhalgh, R. K., 218
Grierson, R. A., 263
Grieve, R. O., 891
Griffith, D. O., 1148
Grigg, R. P., 1032
Grindod, J., 361, 851
Groff, J., 854, 1351
Groff, J. L. E., 1497
Gross, —, 76, 210, 238
Grosskinsky, —, 213
Grote, H. W., 951, 1088, 1222
Groth, V. J., 747
Grundmann, —, 258
Grunwald, A., 971
Gruschke, —, 112
Guenoche, H., 434
Guillemin, A., 1326
Gulf Research and Development Co, 79
Gums, W., 1616
Gunmaer, R. R., 1555
Gunning, S. D., 28
Gunther, V. H., 977
Gussow, W. C., 1391
Guthrie, V. B., 363, 1116
Guyot, R., 1339

Hadley, D. J., 218
Haensel, V., 208, 951, 1088, 1222
Hafsten, R. J., 747, 1369
Hagemann, —, 106, 198
Hahn, —, 103
Hahn, O., 1448
Halbouty, M. T., 5, 627–8, 1510
Hale, A. R., 512, 611, 872, 1502, 1605
Hall, C. C., 1223–4
Hall, D. S., 408
Hall, R. T. W., 740
Hallfeldt, F., 1080
Hamer, J. P., 242
Hamilton, H. L., 685
Hancock, H. M., 1450
Hangs, F. C., 1202
Hansen, K., 1410
Hantha, C. H., 1500
Harber, H., 478, 595, 732
Hardin, G. C., Jr., 5, 627–8, 1510
Harding, S. R. L., 889
Harker, R. P., 1112
Harnsberger, W. T., 1392
Harpener Bergbau AG., 213
Harper, R. C., 580
Harris, J. F., 970
Harris, J. J., 426
Harrison, E., 154
Hart, W., 445
Hartz, H. J., 1064
Harvey, D., 1106
Harvey, R. J., 336
Hatch, L. F., 741, 1247
Hatfield, J. A., 179
Hatfield, R., 391
Havemann, H. A., 850
Havenaar, L., 663
Hawkes, A. S., 714
Hawkins, H., 405
Hawkins, M. F., 669, 1182
Hawthorne, W. R., 617
Hayes, G. L., 254
Hayhurst, L. J., 1360
Hazebroek, P., 324
Hazelwood, R. N., 1131
Headington, C. E., 456
Headrick, J. F., 119
Heard, T. C., 1190
Heater, W. E., 29
Hedberg, H. D., 1, 29, 625
Heinmann, H., 411
Heinrich, F. J., 587 1595
Heinrich, J., 1587
Heinrich, R. L., 254
Heinzel, —, 191
Heilin, M., 1446
Helm, C., 918
Hemfort, H., 460
Henderson, W. R. S., 652
Hendricks, H. L., 468
Henkelekian, H., 188
Henquest, R., 1022, 1388
Henshilwood, C. P., 701
Herbert, —, 76, 202, 213, 238
Herbert, E. Le Q., 183
Hern, R., 364
Heron, A. E., 837
Herrmann, R. H., 1086
Hertwig, W. R., 949
Herzog, G., 17
Hessin, T. D., 167
Heuer, G. J., 161
Hibard, G. G., 28
Higgins, G. E., 1187
Higgins, R. V., 157
Hill, E. F., 239
Hill, P. W., 272
Hill, R. W., 63
Hillinckx, L. J., 511
Hills, A. T., 371
Hillyer, J. C., 265
Hine, H. J., 624
Hines, J. E., 60
Hirsch, J. N., 1316
Hirsch, P. B., 869
Hixon, F. E., 1007
Hoag, S. B., 1200
Höckel, —, 258
Hodgson, G. W., 651
Hodson, P., 1254
Hoehne, K., 266
Hoffman, A. E., 254
Hoffmann, H., 266, 599, 1352
Hofmeister, —, 60
Holek, S., 1322
Holland, H., 356
Holmes, S. E., 1468
Holter, L. E., 673
Holthaus, —, 60
Holtman, —, 110
Hoog, H., 428
Hoppe, —, 202
Hoot, C., 128, 1264
Hornaday, G. F., 568, 720
Horne, W. A., 1316
Horr, C. A., 627
Horstman, W. G., 350, 782
Horton, L., 1364
Houdry Process Corpn, 76
Houpeurt, A., 1298
Howard, G. C., 34
Howell, W. C., 264
Huang, C. J., 723
Hübmann, —, 213
Huck, G., 1114
Huddlestone, J. G., 1577
Huebotter, E. E., 771
Huge, E. C., 1253
Hugel, G., 1237
Hughen, P. L., 359
Hughes, C. J., 1239
Hughes, E. C., 239
Hunt, A. D., 11
Hunt, C. W., 653
Hunt, E. B., 774
Hunt, J. M., 10, 645
Hunt, K. C., 1340
Hunt, R. A., 1212
Hunter, E. E., 123, 1614
Huntington, R. L., 583, 1072
Hurley, T. F., 116
Hurst, R. E., 1297
Hussong, R. U., 1360
Hutton, J. F., 1474
Hyde, A. P., 1304
Hydrocarbon Research Inc., 218
Hyzer, R. E., 706

I.C.I., 218
Imbrie, J., 1399
Imlay, R. W., 647
Ingalls, P. C., 1031
Insall, A. J., 455, 590
Ireland, H. A., 1398
Irizarry, O. B., 137
Irwin, J. S., 1268
Ivanov, V. S., 1006
Iverson, R. L., 214

Jacobs, D. J. H., 218
Jaeger, J. J., 243
Jager, —, 265
Jager, A., 870, 1128
Jahnentz, —, 198, 209
James, A. T., 726
Jasek, A. W., 1382
Jelen, F. C., 1530
Jenkins, R., 32
Jennings, L. A., 264
Jessen, F. W., 1161
Jessup, R. S., 1463
Jodry, R. L., 1390

Johnson, A. I., 720
Johnson, A. L., 398, 551
Johnson, F. B., 406, 588
Johnson, H. F., 196
Johnson, J. W., 240
Johnston, J. J., 776
Johnson, R. H., 1483
Joklik, —, 238
Jonas, C-Z., 1129
Jonash, E. R., 1578
Jones, E. R., 742
Jones, E. P., 216
Jones, H. F., 985
Jones, H. H. M., 1440
Jones, L. W., 1368
Jones, M. C. K., 416
Jones, — A., 401
Jones, W. I., 1387
Jordan, L., 629
Josse, R., 260
Jouy, M., 434
Jullian, Y., 285
Junge, C. H., 481
Jungers, J. C., 578, 825, 967, 1446
Jungewelter, N., 1355
Jurkiewicz, J., 429

Kadmer, E. H., 97
Kahler, H. L., 1606
Kalb, —, 103
Kalichevsky, V. A., 1569
Kamm, V. M. G., 1545
Kane, D., 39
Karlic, S., 1286
Karpinski, T., 316
Kattwinkel, G., 870, 1128
Katz, D. L., 148, 222, 224, 556, 831
Kaucic, M., 1601
Kay, J. H., 211
Kays, W. M., 1203
Keane, C. C., 784
Keeling, H. J., 876
Keilen, J. J., 1243
Keller, G. J., 1538
Keller, W. M., 1238
Kelley, R. E., 701
Kellog, H. W., 1328
Kellogg Co, M. W., 218
Kelly, R. B., 790
Kelly, R. G., 1067
Kemler, E. N., 147
Kemp, J. D., 723
Kennedy, F. K., 1066
Kennedy, R. M., 79
Kennedy, W. L., 349
Kent, P. E., 15, 659
Kenworthy, C. S., 45
Kermarrec, F., 1343
Kestner, R. S., 50
Kiemstedt, H., 1506
Kieschnick, W. F., 154
Kiguchi, S. T., 195
Killer, M., 35, 99, 832, 1515
Killingsworth, R. B., 1467
Kilpatrick, M. O., 408
Kimmel, M. L., 669
King, J. A., 1478
King, J. G., 463
King, R. O., 452, 615
Kinney, R. E., 226
Kipp, E. M., 734
Kirk, E., 1110
Kirk, J. C., 469
Kirk, R. S., 402
Kirschbaum, E., 1548
Kislow, A., 1284
Klanjscek, D., 827
Klause, E. E., 1475
Klaver, R. F., 1229
Kleemann, H., 585
Klein, —, 264
Kleinschmidt, L. R., 255, 1593
Klemm, —, 209
Klinger, R. F., 1026
Kloepfer, —, 95
Klohn, C. H., 1527
Klonne, Fa., 180
Klotz, R. L., 19
Kmiecik, M., 1289
Kneule, F., 461
Knowles, W. S., 265
Knutson, C. F., 672
Kobayashi, R., 151
Kobe, K. A., 1221
Köibel, —, 77, 83, 264
Köibel, H., 85
Koifenbach, J. J., 248
Kolling, —, 112, 209
Komarewsky, V. I., 212
Konopicky, K., 1320
Kontrec, S., 827
Koppe, P., 907
Koppers G.m.b.H., 103, 112, 198, 238
Kornfeld, J. A., 131, 160, 548
Kramers, H., 941
Krebill, F. K., 336, 1176
Krebs, —, 202
Krebs, R. W., 218
Krekeler, —, 218
Kretzschmann, —, 198
Kristensen, H., 809
Kröger, —, 213
Kröger, C., 1080, 1249
Krpan, D., 1460
Kues, H. A., 648
Kullmann, W., 972
Kul'pina, E. P., 503
Kunstmann, F. H., 970
Kunz, K. S., 1521
Kurata, F., 150
Kuropieska, J., 995, 1322
Kwaczewska, A., 454
Kyger, W. M., 1154

Labouysse, M., 1290
Labre, J., 1348
Lagerwey, —, 1207
Lahee, F. H., 21, 1418
Landau, R., 1246
Landen, R., 1600
Landers, J. E., 1504
Landrum, B. L., 1180, 1294
Lane, S. C., 218
Lane-Wells Co, 28
Langenheim, R. L., Jr., 7, 643
Langhein, W., 576
Lanum, W. J., 309
LaQue, F. L., 746
Larson, C. M., 1119
Laszlo, T. S., 715
Latimer, J. R., 1520
Laval, R., 1470
Lavrovskii, K. P., 1213
Lawrence, A. S. C., 437
Lawrenz, R. A., 75
Lea, P. J., 28
Leach, R., 687
Leary, R. F., 78
Leavenworth, M., 62
Lee, B. D. 17
Legatski, T. W., 1580
Legrand, M., 1500
Lehrer, —, 238
Leibson, I., 197
Leidl, G., 877
Leithe, —, 238
Leloup, L., 1472
Len, H., 930
Le Roi Co, 28
Lester, C. B., 177, 351–3, 786, 1058
Lester, G. W., 1426
Levy, N., 218
Levy, W. J., 278
Lewicki, W., 902, 1583
Lewis, E. H., 1557
Lewis, H., 1505
Lewis, R. H., 492
Lewis, W. K., 229
Liedholm, G. E., 1558
Lien, A. P., 71, 80
Life, W. E., 1425
Lindahl, E. C., 219
Linderoths Patenter AB., 81
Lindner, J. D., 1184
Lindsay, R. E., 1577
Litchfield, W. H., 569
Logan, K. M., 274
Lohmann, G., 972
Loktev, S. M., 572
Loofbourow, R. L., 367
Loper, B. H., 1083
Lopmann, —, 83
Lopmann, B., 956
Lorengel, E., 834
Lorenz, —, 238
Loughry, T. F., 204
Lowe, A. G., 1581
Lowe, R., 1192
Lowenstein, J., 1071
Lowy, L., 1135
Loy, M. E., 23
Luchter, A., 4, 1334
Luchterowa, A., 884
Lummus, J. L., 664
Lundburg, H., 897
Lundeen, R. W., 935, 1547
Lupfer, G. L., 68
Luther, H., 834
Lyles, H. R., 955, 957, 1312
Lyman, A. L., 1385
Lynn, C. V., 922, 1055–6
Lyons, P. L., 1280

Mabbs, E. G., 702
Mabey, D. R., 660
McAfee, J., 1316
McArd, G. W., 1519
McArthur, D. S., 1111
McCabe, L. C., 281
McCabe, W. S., 637
McCann, W. L., 319
McCarver, H. C., 1174
McCaslin, J. C., 291, 294–5, 766, 890
McCauley, D. A., 71, 80
McClain, D. S., 288
McCloud, D. M., 276
McClure, C., 1433
McClure, D. J., 445
McClure, G. M., 792
McClure, W. L., 64
McCracken, E., 764
McCutchan, P., 235
McDowall, A. R., 1386
MacDowall, J. M., 1423
McEachern, D. J., 913
McEwen, C. R., 313
McFatter, W. E., 73
McGarry, F. J., 1602
McGee, D. A., 904, 1043
McGilvray, A., 344
McGiven, J. M., 1019–20
McGowan, F. L., 264
McGrath, H. G., 218
McGregor, D. J., 638
McGuire, W. J., 154
McIntosh, W. A., 1243
McKetta, J. J., 1230
Mackintosh, C. F. M., 623, 758
McLaren, J., 555
Macleod, D. M., 707
McNair, A. H., 654
MacQuown, W. C., Jr., 1400
McWaters, R. J., 1155
Madden, W. E., 754
Madruk-Ges, 83
Madsen Iron Works, 258
Madsen, W. M., 258
Maffezzoni, U., 845
Mahncke, H. N., 1486
Maier, A. F., 385
Major, C. J., 1073
Mallison, H., 495, 605, 1005, 1594
Malloy, J. B., 74
Malone, G. F., 1374
Malschaert, F. P., 527
Manci, C., 210, 871
Mann, F. W., 275
Mansfield, W. P., 849
Manson, N., 1465
Mantell, R. M., 218
Maples, R. E., 233
Mapstone, G. E., 1449
Mardles, E. W. J., 89, 581
Mardock, E. S., 155, 1046
Maretic, M., 101
Markovitz, H., 1454
Martin, —, 218
Martin, C. W., 48
Martin, M., 348
Martin, W. L., 223
Martin, W. O., 1053
Martinez Cordon, J. L., 1228
Mason, H. C. L., 1386
Mason, J. F., 29
Mason, P. W., 574
Matheson, G. L., 76
Mathieu, J. L., 1431
Mathews, C. S., 324
Mathews, J. B., 1474
Mattix, E. D., 818
Mayland, B. J., 215, 218, 220
Meerbott, W. K., 413
Meltzer, I., 606
Menard, H. W., Jr., 883
Mernitz, P., 1534
Merriam, D. F., 763, 1166
Messer G.m.b.H., Adolf, 238
Metallges AG., 69, 76, 198, 202, 209, 213, 238
Metzendorf, W., 604
Metzger, —, 254
Metzner, A. B., 189, 229
Mewes, —, 238
Meyer, G. C., 1485
Meyer, H. J., 1457
Meyer, L. W. A., 1373
Meyer, R. E., 1315
Michael, —, 209
Michaud, M., 435
Migaux, L., 661
Mikeska, L. A., 254
Miladinovic, M., 16
Milazzo, G., 798
Miller, C. B., Jr., 843
Miller, H., 541
Miller, J. C., 1161
Miller, L. S., 335
Millikan, W. E., 1400
Millikin, B. T., 35
Mills, G. A., 76, 1211, 1552
Mills, J. F., 1376–7
Milne, A. A., 108
Mirzoeva, E. A., 1006
Mischke, K., 902
Mitchell, H. A., 507
Mize, W. M., 780
Mize, W. W., 681
Molinero, R., 317
Moneymaker, B. C., 6, 639
Monicard, R., 126
Monnot, G., 435, 824
Monsanto Chemical Co, 265
Montgomery, C. W., 1316
Montgomery, D., 937
Moody, G. B., 678
Moon, L. B., 178
Moore, D. G., 2
Moore, G. Z., 192
Moore, J. M., 1297
Moore, J. W., 703
Moore, T. V., 28
Moorman, J. W., 712, 1556
Moran, J. P., 164
Morbeck, R. C., 566
Moreton, D. H., 250, 254
Morris, W. E., 232
Morrisey, N. S., 130, 133, 168, 305, 632, 676, 844, 885–6, 1261, 1263, 1267, 1417
Morse, A. J., 1072
Morse, R. A., 1045
Mortlock, D. H., 550
Mosteller, J. C., 1478
Mosurski, H., 1346
Mottern, H. O., 218
Mougey, H. C., 246
Moyal, M., 777, 1277
Muendel, C. H., 1108
Müller, —, 69
Müller, H. E., 598, 1130
Mullins, B. P., 93
Munderloh, H., 1100
Munk, P., 1550
Munro, J. D., 1009
Murray, C. A., 1010
Murray, G. E., 1396
Musgrave, F. F., 473
Myers, A. T., 627
Myers, J. P., 1046
Mysliwiec, J., 1002

NACE Technical Unit Committee 1–G, 748
NACE Technical Committee T–1J, 1367
NACE Technical Unit Committee T–1K, 1145
NACE Technical Unit Committee T–2D, 1149
NACE Technical Unit Committee T–3A, 1366
NACE Task Group T–3E–1, 1375
Narasimhan, T. L., 850
Natarajan, A., 850
National Petro-Chemicals Corpn, 218
Natta, G., 1321
Nedelmann, H., 603, 864
Nelson, E. W., 469
Nelson, L. B., 751
Nelson, W. L., 953
Neumaier, B. W., 1252
Newberg, A. H., 174, 514, 1147
Newchurch, E. J., 69
Newitt, D. M., 593, 1060
Newton, C. E., 57
Nicewander, D. A., 265
Nichols, C. W., 1467
Niclause, M., 87
Nielson, E. K., 1360
Nielson, R. F., 323
Niemann, G., 969
Niementowska, I., 54
Niemientowski, S., 975, 1314
Nijboer, L. W., 858
Noaker, L. J., 148
Noll, H. D., 952
Noone, M., 368
Norris, D. E., 76
North, H. C., 68
Northup, M. S., 68
Norton, R. D., 936
Nougaro, J., 126
Nowak, T. J., 1426
Nussel, H., 489, 1000

Oberbach, J., 737
Obergfell, P., 206
Oblad, A. G., 411, 945, 1211, 1551
Obolentsev, R. D., 571
O'Brien, T. B., 1044
Obuchowicz, Z., 145
Ocamb, R., 1032
Odasz, F. B., 948
Oden, E. C., 697
Oehler, H. A., 940
Oettinger, —, 77
Oevirk, F. W., 1477
Offeringa, 775
Offutt, W. C., 79
Ogrodnik, A., 397
Olansen, M. A., 1428
Oliver, J., 62
Olley, R., 1536
Olson, W. S., 14, 652

Olson, W. T., 1578
O'Neill, L. A., 117
Opdenberg, W., 460
O'Quinn, P. C., 1425
Orchard Lisle, B., 1437
Organick, E. I., 1109
Organick, E. J., 1457
Orgeval, M., 895
Orr, A. R., 1562
Osborn, R. J., 1095
Osmond, J. C., 646
Osmun, F. W., 28
Osoba, J. S., 1424
Ostaszewski, J., 143
Otto & Comp G.m.b.H., Dr C., 238
Overcash, R. L., 445
Owen, H. D., 773

Packie, J. W., 696
Padden, F. J., 1454
Padovani, C., 846, 871, 877, 1023, 1233
Paille, E. B., 391
Pakiser, L. C., 660
Paleari, C., 448, 1233, 1451
Palmer, L. L., 1165
Paraszczak, W., 911
Paredes, F., 684, 780
Parekh, R. H., 1551
Parish, C. E., 793
Parker, E. H., 49
Parker, H. A., 1220
Parker, I. M., 350, 782
Parker, M. E., 355, 1383
Parsons, W. A., 188
Pasche, A. T., 358
Pass, F., 433
Passega, R., 626
Passino, H. J., 218
Paterson, E. V., 1236
Patrik, E. A. K., 704
Patterson, A. C., 416
Patton, J. L., 287
Patzau, S., 1349
Paul, M. J., 687
Pawlik, —, 235
Pawlikowski, S., 1380
Pearce, C. A. R., 1570
Pearson, G. H., 699, 934, 1075
Peavy, C. C., 1211, 1552
Pechstein, —, 180
Peck, R. A., 493
Pedrazzini, C., 829
Pedrini, R., 1476
Penner, S. S., 92
Perkins, F. M., 125, 1424
Perrin, G. H., 498
Perrine, R. L., 1181
Perthuis, E., 1461
Peters, M. S., 1214
Petrarca, C. A., 716
Petroleum Gases Panel of Institute of Petroleum, 840
Petrov, Yu. V., 503
Petrovsek, J., 964
Pfeiffer, C., 1318
Phillips, C., 391
Phillips Petroleum Co., 28, 64, 68, 218, 220, 265
Phleger, F. B., 1394
Piatkiewicz, R., 142
Picard, A. D., 765
Picardi, E. A., 58
Pickel, T. W., 701, 790
Pier, —, 77
Pier, M., 1215
Pietsch, H., 974
Pilz, —, 238
Pinfold, E. S., 37, 674
Pingrey, G. D., 439
Plotter, E. C., 1253
Pitzer, E. W., 207
Pivnick, H., 1495
Pluta, J. S., 308
Podbielniak, W. J., 1572
Polderman, L. D., 1216, 1598
Pöll, H., 433
Pollak, C., 526
Pollard, A., 560
Pollock, A. W., 805
Polny, W. J., 479
Polubarinova, P. Ya., 910
Poor, W. B., 781
Popkin, A. H., 254
Porges, F. B., 545
Porter, H. F., 1532
Poupon, A., 23
Poustovalov, J., 1416
Power, H. H., 161
Power, W. R., 1462
Prange, F. A., 119
Prater, N. H., 1205
Pratt, H. R. C., 70, 377, 400, 822, 944
Pratt, R. S., 218
Preiser, H. S., 1376–7
Preston, S. T., 1572
Prica, N., 40
Price, W. A., 1027
Price, W. C., 1105, 1575
Procopi, J., 721
Pryor, R. C., 28
Pugh, W. M., 1489
Purcell, P. E. M., 1175
Purdy, G. E., 1153
Puschhof, S., 218
Putscher, R., 594

Quarleri, L., 1323
Quon, D., 431

Rabinowicz, E., 466
Radcliffe, A., 465
Radd, F. J., 1378
Ragatz, E. G., 390
Rahmes, M. H., 1066
Raiford, L. L., 1555
Raifsnider, P. J., 1144
Rambo, M. L., 218
Ramsey, D. E., 1297
Ramsey, R. P., 618, 752, 878, 1015
Rand, M., 615
Randi, M., 444
Rao, M. R. K., 850
Raschig, K., 1354
Rase, H. F., 402
Rasmuss, J. E., 767
Ratelband, J. B., 382
Ratliff, R. A., 563
Raudenbusch, H., 488
Raymond, L., 472
Rearick, J. S., 181
Reasoner, M. A., 11
Reay, W. H., 812, 960, 1089
Redlich, O., 68
Reed, P., 42–3, 46, 59
Reich, —, 209
Reichswerke AG., 235
Reid, E. B., 1455
Reidel, J. C., 1210
Reman, G. H., 582
Renouard, G., 893
Resen, F. C., 60, 1303
Resen, F. L., 73, 146, 375, 420, 1199, 1531, 1608
Rettig, H., 969
Revenda, J., 968
Rex, H. M., 493
Reynaud, F., 107
Renolds, J. C., 215
Reynolds, J. J., 22
Rhea, T. R., 879
Rheinpreussen AG., 77, 83, 200, 264
Riba, O., 1415
Rice, T., 203
Richardson, C. B. W., 457
Richardson, J. G., 1424
Richfield Oil Corpn, 81
Rick, A. W., 491, 601, 735, 1127
Rick, W., 999, 1589
Rick-Weismann, B., 999
Ries, H. E., Jr., 1098
Riffer, D., 56
Riggs, C. H., 677
Ringer, F. W., 1151
Rintoul, W. T., 339
Rio, A., 1003
Rippie, C. W., 418, 562
Riseman, J., 580
Ritch, H. B., 158
Roark, G. E., 1184
Robert, L., 973
Roberts, C. H., 167
Roberts, R. W., 1526
Robinson, L. A., 1227
Robinson, S. P., 218
Rocca, J. P., 78
Rodriguez, F., 801, 942
Roelen, —, 112, 238
Roemershauser, A. E., 1182
Rohlich, G. A., 391
Rohrback, G. H., 276
Ross, T. K., 376, 1103
Rosser, W. H., 1430
Rossi, C., 1323
Rossig, —, 254
Rossoff, C., 1512
Roth, R., 1393
Rottig, —, 112, 114, 202, 209–10
Royen, —, 210, 238
Royle, D., 985
Rubin, L. C., 218
Ruchhoff, C. C., 391
Rudershausen, C. G., 438
Rudge, A. J., 1123
Ruhrchemie AG., 106, 112, 114, 198, 202, 209–10, 213
Ruhrchemie Akt, 218
Ruland, W., 1249
Rumble, R. C., 1186
Rumeau, J-L., 895
Rummerford, B. F., 308
Runge, F., 86, 414
Rüping, —, 213
Ruschenburg, E., 85
Rush, E. E., 64
Russell, G. I., 751
Russum, L. W., 949
Ryan, J. G., 254
Ryman, L. J., 1162
Rzepecki, S., 905

Sachs, K., 1505
Sag, N., 1546
Sager, F., 1564
Sakamoto, T., 1407
Salé, B., 1461
Salmon, P., 1018
Salmon, R., 1104
Salomon, T., 262, 496
Saiz, L., 476
Samans, W., 1074, 1311
Samuelson, C. J., 799
Sander, O., 908
Sandler, H. J., 1318
Sandler, S., 452
Sandlin, H. L., 1232, 1331
Sandona, O. J., 562
Sanford, R. A., 804
Sanger, E., 1120
Sarida, V., 327
Sarjant, R. J., 558
Sarno, D. H., 1558
Sayer, R. G., 985
Scarlett, N. A., 1474
Scearce, F. A., 771
Schaafsma, A., 1085
Schade, —, 213
Schafer, —, 202
Schafer, H., 109
Schall, J. W., 952
Schay, F. J., 1260
Scheibel, E. G., 200
Schenk, —, 210
Scheurer, A., 736
Schiessler, W., 1102
Schildwachter, H., 1158
Schiller, W., 160
Schilling, A., 854
Schillmoller, C. M., 1252
Schlaer, J. J., 264
Schleede, D., 1107
Schlewitz, —, 81
Schlocker, J., 647
Schlumberger, —, 110, 258, 270
Schmalenbach, —, 112
Schmeling, F., 548
Schmitt, A., 1358
Schmitt, G. T., 633
Schmitz, —, 114
Schmitz, P. M. E., 1188
Schneider, —, 258
Schneider, A., 79
Schneider, F. N., 774
Schnur, —, 198
Schoeller, H., 1281–2
Schorre, C. E., 41
Schram, A., 433
Schulte, —, 258
Schulz, H. D., 96
Schulze, K., 998
Schuman, S. C., 1248
Schuster, F., 458
Schutte, A. H., 76
Schutze, H. G., 218
Schwalm, L., 1372
Schwarz, —, 198
Schwarz, N., 1178
Schwegler, C. C., 218
Schweisheimer, W., 1611
Schweitzer, P. H., 121
Schweuke, —, 83
Schwenker, H., 1478
Scogin, R. J., 1373
Scott, P. P., 34
Scott, W. R., 276
Seay, J. G., 719
Sedijatmo, R. M., 176
Sef, F., 101, 1601
Seismograph Service Corpn, 19
Selke, W. A., 1108
Sellers, E. S., 72
Seymour, R. B., 1313
Shannon, R., 927
Sharpe, G. C. H., 1499
Sharpe, L. G., 1381
Shearin, H. M., 1520
Sheffield, J. V., 948
Sheldon, J. W., 159
Shell Development Co, 68, 218, 241, 254
Shepard, A. P., 1155
Shepard, F. P., 2
Shepherd, G. L., 1154
Shepherd, W. C. F., 221
Sherman, P., 1099
Sherwood, P., 813
Sherwood, P. W., 509, 718, 862–3, 866, 874, 954, 958–9, 1133, 1533, 1561, 1597
Shideler, N. T., 783
Shkirich, A. H., 910
Shmidl, A. J., 254
Shock, D. A., 271, 275, 1504
Shor, G. L., 1496
Siebert, —, 198
Siegmund, C. W., 816
Sierek, C., 318
Sikora, F., 996
Silk, P. B., 1615
Simonovic, M., 1524
Sims, G. V., 1052
Siniramed, C., 201, 448, 871, 877, 1233, 1451
Sittig, M., 508, 714
Sittler, C., 1028
Skelton, J. D., 1041
Skiba, E. J., 703
Slobod, R. L., 1427
Smalling, J. W., 407
Smith, C. W., 330
Smith, D. T., 303, 537, 896, 1513–14
Smith, G. H., 549
Smith, J. C., 1532
Smith, J. D., 468
Smith, J. F., 88
Smith, J. M., 185
Smith, M. R., 82, 570
Smith, P. V., 254
Smith, R. A., 1059
Smith, R. V., 668
Snell, C. T., 865
Snell, F. D., 865
Snow, H. A., 1471
Socolofsky, J. F., 472, 1467
Socony-Vacuum Oil Co, 19, 76
Soderquist, F. J., 218
Sohns, H. W., 1142
Solik, J., 1302
Somers, F. C., 1443
Sonnenkalb, O., 916
Soukiassian, L., 976
Spann, R. E., 343
Speed, K. W., 408
Spengler, G., 972
Spiske, —, 112
Springer, —, 213
Staffel, E. J., 1076
Stahmer, A. M., 778
Standard Oil Co, 58, 71, 80–1, 218, 239, 254
Standard Oil Development Co, 28, 68–9, 76, 78, 218, 241, 254, 264
Stankiewicz, E. J., 1309
Stanley, M. E., 439
Stanley, W. E., 81
Stanolind Oil and Gas Co, 218
Stanton, J. P., 580
Starr, C. E., 69
Steel, R. A., 949
Steele, A. B., 1216
Steiner, H., 623, 758
Steinitz, E. W., 245
Steinrath, H., 1013–14
Stephenson, R., 193
Sterba, M. J., 208, 951, 1088, 1222
Sterkman, —, 1207
Stetter, —, 112
Stevenson, D. H., 952
Stewart, C. R., 174
Stewart, D., 549, 1442
Stewart, D. E., 836
Stewart, F., 10, 645
Stewart, F. M., 165, 1176
Stickdorn, —, 258
Stiles, R., 815
Still, Fa., 258
Stock, —, 202
Stockholm, C. J., 1232, 1331
Stoker, W. R., 499
Stokes, M. A., 619
Stoller, —, 81
Stormont, D. H., 166, 195, 881
Stovall, W. B., 583
Straley, H. W., III, 288
Stranch, C. B., 539
Strasser, D. M., 743
Strauss, —, 81
Strickland, J. W., 644
Stripling, A. A., 304
Strobel, W. B., 563
Strom, R., 452
Strong, A. K., 1529
Strong, E. R., 391
Stroud, C. D., 1012
Strzelbicki, J. T., 152
Strzetelski, J., 899, 1291
Sturm, R. G., 479
Sudbury, J. D., 271, 275, 1504
Sukkar, Y. K., 1177
Summers, C. R., Jr., 1316
Sun Oil Co, 64, 79
Suss, E., 828

Sutherland, H., 1102
Sutton, W. J., 39
Swakon, E. A., 247
Swaminathan, V. S., 1361
Swerdloff, W., 1191, 1503
Symonds, G. H., 1307
Szadkowski, K., 187
Szostak, L., 1285
Szybinski, V., 968
Szymanski, J., 1291
Szypula, K., 898

Tabor, W., 1486
Tachilzik, R., 47
Tanaskovic, P., 1524
Tangel, O. F., 1532
Tanner, H., 1053
Tannhauser, J. U., 302
Tasic, M., 1524
Taylor, A. H., 1223
Taylor, E. E., 1255
Tayloy, J. B., 1209
Teatini, A., 814
Teeters, W. O., 218
Temme, T., 487, 1001, 1353, 1590
Templeton, C. C., 36
Tennant, F. M., 218
Teriuin, G., 859
Terrers, E., 267, 432, 1139, 1359
Terry, J. M., 1046
Texas Co, 17, 218
Thalmann, E. H., 750
Thayer, W. W., 920
Thevenin, R., 602
Thirion, B., 962
Thoenes, H. W., 833
Thomas, A., 593
Thomas, F. M., 1456
Thompson, C. N., 499
Thompson, E. T., 760
Thomson, A. G., 547
Thomson, J. E., 687
Thornton, D. P., 417, 510, 682
Thornton, D. P., Jr., 753, 1093, 1305
Thorpe, R. E., 254
Thorsteinsson, R., 654
Thring, M. W., 823
Tichvinsky, L. M., 1489
Tiedje, J. L., 710
Tinel, G., 502
Tinner, —, 198
Tippit, J. J., 57
Tixier, M. P., 23, 1521
Todhunter, H. A., 1371
Tokarski, A., 3
Tollenaar, D., 1447
Tong, R. W., 484, 1480
Torrey, P. D., 1295
Totzek, —, 238
Toulmin, L. D., 887
Townend, D. T. A., 440
Tracey, G. W., 1299
Tracy, G. W., 1048
Traina, G., 847
Tramm, —, 112, 209, 238
Tramm, H., 218
Transtej, S., 1336
Treadwell, R. C., 628
Treseder, R. S., 749, 1144
Trexel, J. J., 241
Tripp, R. M., 1024
Tropper, H., 1498
Trotter, C. H., 57
Trusler, J. D. C., 671
Tucker, P. N., 1115
Turechek, G. F., 28
Turnbull, H., 391
Tusson, J. R., 1220
Tutwiler, T. S., 242
Twaits, W. O., 1523

Uhl, P. W., 283
Uhl, W. C., 1078
Umbach, —, 213
Umholtz, C. L., 1541
Union Oil Co of California, 69, 76, 218, 235
Universal Oil Co, 218
Universal Oil Products Co, 64, 68, 76, 81, 254
Urner, R. S., 725
Utzmann, R., 306
Uyeno, S., 1495

Vacuum Oil Co, 1350
Vallaud, A., 1018
Valis, J., 1579
Valois, M., 1599
Valussi, S., 841-2
van den Berg, G. J., 800
van der Heyden, H. C., 1435
van der Peol, C., 775
van der Waarden, M., 90
van Leckwijck, W., 1408
van Lelyveld, H., 1544
Vann, J. O., 19
Van Winkle, M., 192, 223, 393, 561, 940, 1541
Vatan, A., 1412
Vaughan, H. M., 569
Valetic, S., 40
Vener, R. E., 1227, 1553
Verkaufsvereinigung für Teererzeugnisse AG., 103
Verstappen, J. J., 113
Villar, G. E., 1208
Vincent, G. H., 218
Vincent-Genod, J., 1508
Vogel, —, 110, 258
Vogel, Leutkirch, 110, 258
Vogeipohl, G., 855
von Esterff, F. E., 29
von Füner, —, 77
von Hahn, B., 1445
von Schuchmann, —, 265
Voorhees, V., 1082
Vorman, E. J., Jr., 607
Voss, K., 1588

Wachal, A. L., 1610
Wachter, A., 1144
Wacker-Chemie G.m.b.H., 103
Wackier, R. S., 861
Wade, D. E., 553
Waetjen, C. H., 738
Waliduda, A., 529
Walker, A. O., 589
Wallace, E. A., 1435
Wallace, P. A., 1033
Wallick, G. C., 149
Walper, J. L., 1261
Walsh, T. J., 801
Walson, K. A., 1369
Walton, P. T., 1401
Ward, J., 75
Ward, J. M., 727
Ward, T. G., 1050
Warren, J. E., 1185
Warren Petroleum Corpn, 53
Warrick, R. E., 660
Wassall, H., 1168
Waterman, H. I., 113, 1229, 1327, 1565
Watkins, J. W., 155, 1296
Watson, C. C., 438
Watson, F. G., 1452
Watson, H. J., 1345
Watson, M. S., 1050
Watt, J. J., 456, 1450
Watts, J. C., 1379
Watts, R. N., 218
Weber, G., 404, 1308, 1618
Weber, J. H., 724
Weiler, —, 238
Weingartner, R. A., 1042
Weinmayer, V., 265
Weisel, C. A., 242
Weismantle, E. E., 1487
Weiss, H., 259
Welborn, J. Y., 492
Welch, L. M., 78
Welsh, R. J., 617
Wenger, W. J., 309
Wengerd, S. A., 644
Wenzel, —, 209, 218
Wessing, W., 1434
Wessolek, —, 238
West, W. J., 159
Westerdijk, J. B., 1229
Whalen, J. W., 156
Whaley, T. H., 64
Wheeler, R. N., 1365
Wheeler, R. W., 610
White, H. M., 1468
Whitmore, H. E., 254
Whittier, F., 183
Wichert, P., 1592
Widmaier, O., 441
Wiebe, R., 984
Wiedmann, —, 209
Wieland, R., 749
Wierzchowski, T., 25, 325
Wies, C., 241
Wilder, A. B., 1193
Wiley, R. M., 579
Wilford, A. T., 1584
Wilhelmi, R., 998
Wilk, Z., 909
Wilke, H., 567
Wilkinson, W. F., 206
Wilks, P. A., 217
Williams, A. E., 447
Williams, C. G., 1612
Williams, F. S. G., 546
Williams, G., 983
Williams, R. B., 224, 831
Williams, R. H., 668
Williams, S. V., 1194
Willig, —, 202
Willig, E., 564
Willis, R. L., 993
Willson, C. O., 1256
Wilsey, L. E., 321, 1299
Wilson, C. O., 337
Wilson, C. P., 76
Wilson, D. L., 772
Wilson, G. W., 701
Wilson, J. L., 634
Wilson, N. G., 374, 1528
Wilson Supply Co, 39
Wilson, W. A., 1212
Winberg, H. T., 104
Winn, F. W., 1538
Winsauer, W. O., 125
Winter, C. V., 888
Winterbottom, J. J., 544
Winzen, W., 1140
Winfeld, —, 69
Withers, J. G., 486, 853
Wojnar, J., 118, 1287
Wojnar, K., 312
Wolwowicz, R., 925
Wonfor, J. S., 650
Wood, R. E., 588
Wood, R. G., 406
Woodcock, C. A., 218
Woodhans, R. T., 1132

Yarham, O. L., 470, 1125
Yost, W. J., 19
Young, D. A., 235
Young, E. H., 224, 556
Young, R. S., 1302
Younger, A. H., 1206

Zahnstecher, L. W., 716
Zajac, S. J., 254
Zalkin, C. L., 325
Zandona, O. J., 418
Zaslavskii, Yu. S., 1496
Zeien, J. T., 405
Zein, M. E., 1498
Zepf, K., 86, 414
Zerbe, —, 264
Zerbe, C., 530
Ziegler, —, 79, 114, 218
Ziegler, Mulheim, 79, 218
Ziegler, K., 806
Zimmerschied, W. J., 1212, 1330
Zorn, —, 254
Zosel, —, 79
Zublin, J. A., 28

ABSTRACTS SUBJECT INDEX

Numbers refer to Abstract Numbers. (P) denotes Abstract of Patent Specification.

Absorber :
efficiency, 1066
service, 1067
Absorption :
and stripping design, 1551
bituminous materials by stone, 491
carbon, 2-stage saturation of active, 397
carbon dioxide, 833
gas, 757
gases, recovering pure hydrocarbons or mixtures, (P) 198
mercaptan and amine–H_2S process, electric, 562
NH_3 from coal dist gases, (P) 69
of residual coals, potassium, 1249
oil recovery from cracked gases, (P) 198
recovering O_2-containing compounds, (P) 198
recovery, higher-mol alcohol, (P) 198
saturator for $(NH_4)_2SO_4$ production, (P) 198
weather and natural gasoline plant, 1209
Acetylene :
from natural gas, 726
and petroleum, 1133
carboxylic, long-chain, (P) 112
Acids :
phthalic, anhydride production, (P) 265
sulphonic, producing, (P) 112
sulphuric, from petroleum, 1007
Additives :
for fuels and lubricants, 1119
for lubricating oils, synthesis, 1346
petroleum, five methods for injecting, 1135
" premium," effectiveness, 98
to prevent sludging, 1134
Aden :
oil harbour, 370
pipeline, 789
Adsorption :
carbon, use of activated, (P) 69
catalysis and, 427, 705
contacting solids, process, (P) 69
dehydration of wet gas, 102
gravity moving bed process, (P) 69
new material, 704
processes, (P) 69, 396
Africa :
1953 developments, 29
Equatorial, exploration work, 1405
Air pollution, 1023, 1160
report, 759
review, 281
Aircraft hydrant fuelling, 1341
Alabama :
cenozoic sediments, 887
S., largest oilfield, 888
Alaska, pipeline, 360
Alberta :
Golden Spike field, development, 913
oil sands, 1317
Pembina field production, 170
Stettler area, Late Devonian geologic history, 647
Westward Ho discovery, 1035–6
Alcohols, higher aliphatic unsaturated production, (P) 265
Aldehydes :
from petroleum, 862
making, 715
Aldehydes (*contd.*) :
kinetics and decomposition mechanism, 87
production from petroleum, 959
Alkali lignin *as* emulsion stabilizer, 1243
Alkylation, 810
Al trialkylenes, production, (P) 79
alkyl substituted *cyclo*alkanes, (P) 79
HF unit, three unusual features, 417
olefin with alkyl fluoride, (P) 79
*cyclo*pentanes, (P) 79
phenol and monoalkyl-phenols, (P) 79
plant, new HF, 1562
Alloys, high-temperature scaling heat-resisting, 1505
Ammonia :
cost of manufacture, 1136
from cat reformer off-gas, 1318
manufacture, 420
production, 1215
Analysis :
API Research Projects, progress reports, 450
apparatus for determining ageing resistance of lub oils, 584
catalyst testing procedure, 449
chromatographic :
of crudes, 454
of hydrocarbon mixtures, 1106
chromatography, 975
in the chemistry of coal oxidation products, paper, 453
separation of volatile materials by gas–liquid, 723
coal, oxidation products, 1231
coal tars, 605, 1594
colloidochemical, 605
coking, new data on fluid, 588
colour :
determination, oils, 96
of petroleum products, determination, 1450
continuous, via infra-red, 217
crude oil :
application of statistical, 832
evaluation, 1326
exhaust gas, 1610
extraction, recycle, mineral oil, 97
flash calculations, 1457
fluorescence in oils, 447
fuel vapours and gases, 452
gas, and hydrocarbon extraction, 1448
gas flow, radial, 32
gaseous hydrocarbons, 585
gases, rapid determination of non-hydrocarbon, 837
grease, complex, 722
hydrocarbon, 1572
infra-red, continuous, 1332
IFP strobo-cathodic monograph, 976
ion exchange, continuous, 1108
lubricating oils, 448
microscopic examination of fuel oils, 589
mineral oil, graphic-statistical, 1327
mineral oils and greases, infra-red spectrometry in, 973
molecular spectroscopic, of hydrocarbon chains, 834
N_2 in N–O groups in coal oxidn, estimation, 230
octane picture, 232
oilfield waters, 99
Analysis (*contd.*) :
oils, ageing tendency, 441
phenols, paper chromatographic separation of, 1107
photography in oil research, 455
process instrumentation, 231
quantitative :
of hydrocarbon mixtures, 974
of minerals in rocks by X-ray diffraction, 1029
refining distillate lubricating fractions, procedure, 1453
sample, aid to discovery, 1390
sediments for pollen, 1028
sludges, mineral oil, 968
softening point apparatus, automatic, 446
sulphur in benzine, estimation of elemental, 1449
thermal, miocene clays, 1335
thixoviscometer, 457
transformers, high voltage, 501
tray, locating optimum feed, 234
vacuum flashing, 1232
viscometer, new, 456
water :
in 1-butene, solubility, 1230
presentation of, 1282
solubility in liquid propane, 977
See also Spectrometry, Spectroscopy.
Arabia, *see* Saudi Arabia.
Arctic Ocean, recent sediments, 12
Arctic sea floor, micro relief, 13
Arizona, well, first producing, 638
Arkansas, prospect, 1164
Aromatics production, 1218
Asphalt :
adsorbed films, 437
bubbles in poured, 733
coatings, test, 257
effect of rubbers, 492
fractionation, chromatographic method, 1593
manufacture, current practice, 1244
mats in hydraulic construction, 1356
mixing plants, (P) 258
poured, in road construction, 1592
roof, heat effects, 732
rubber–, paving mixtures, 493
streets, development of town, 734
transport of liquid, 925
Asphaltenes, kinetics of the coking of petroleum, 1213
Association Française des Techniciens du Pétrole, extraordinary reunion, 285
Atomic energy, laboratory for promoting petroleum processing, 755
Australia :
discovery, 1275
exploration plans, 300
exploratory efforts, 345
gas flows, 533
Rough Range discovery, 655
Automobile production, outlook, 1121

Bacteria and oil-bearing areas, tracer, 1334
Bearings :
automotive, lubricating front wheel, 1488
ball, interpreting damage, 1473
calculations on plain, 1472

Bearings (*contd.*):
dry, anti-frictional properties, 1492
engine, design, 1484
literature, 1953 digest, 253
lubricants for roller, 1349
misaligned, oil film pressure distribution, 1477
temperature control, 1494
" Beaver Report " discussion, 1160
Belgium:
sedimentology since 1948, literature, 1408
standardization of sampling and test procedures, 527
Binary systems, vapour–liquid equilibria in, 831
Bio-oxidation of plant waste, 817
Bitumen:
application in roadmaking and industry, 597
asphaltenes, influence, 1003
asphaltic for dike construction, 858
binders, all-weather, 1354
blocks, 1002
coatings, cracking formation, 1589
coverings, the wet sand method for producing, 1000
destruction by microbes, 1353
emulsion stabilizer, 1243
emulsions:
cutback, 997
production, (P) 110, (P) 258
testing procedures, 488
evaluation scales, 487
fillers, 1127
film, preparation by spinning, 255
films, preparing uniform, 256
filter, (P) 258
fire alarm, 587
macadam, bituminous mixed, 1001
materials:
behaviour in u.v. light, 1587
German processing, 1352
mirrored in German patent literature, 599
mixtures of coal tar pitch and, 602
paper, moisture absorption of roofing, 999
revetments in dike construction, 859
roof, heat effects, 732
roofing ASTM and DIN 52128 specifications, 600
roofing paper testing, 601
sealing materials, 597–8
Shell, for producing asphalt mixed macadam, 1126
water–bituminous binder, contact surface phenomena, 998
Bituminous coatings, wet-sand process for preparing, 489
Bituminous coverings for roads, 490
Bituminous dispersions, producing, (P) 110
Bituminous materials:
absorption, 491
processing, 599
Borneo, quest for oil, 677
Brazil, discovery, 1037
Brightray coating, 981
British Columbia:
Cretaceous and some Triassic beds, 649
North Burnaby refinery, 796
wildcat, 135
BP-Benzin- und Petroleum GmbH jubilee, 939
Bunkering plant, automatic proportioning equipment, 820
Butadiene:
1955 consumption, 958
production, U.S., 1596
Butane, effect on road octane no., 1339
*iso*Butane, recovery, Pledger plant, 848
*iso*Butylol contact, 86

Cable oil, changes, 262
Cables, oil-filled electric power, 736
California:
age of Franciscan group, 644
Corcoran clay in San Joaquin Valley, 645
depth records, 338
diving for oil off coast, 134
Eocene production established, 339
exploration, 675
gas injection at Salt Creek, 541
oilfield, textbook, 166
Salt Creek's improved recovery, 541
Cancer and liquid paraffin, 860
Canada:
Elk basin field, 1176
gas discovery, 1268
Leduc discovery, 1523
Lower Silurian deposits, map, 761
Pembina field, 340
polythene plant, 1599
reefs of Woodbend Group, Alberta, 768
refinery, new 20,000-b.d., 1308
trace metals in western crude, 648
undeveloped provinces, 1031
Western, impressions, 1052
See also individual provinces.
Canadian Arctic islands, petroleum possibilities, 651
Carbon:
and hydrogen at high pressure, exothermic reaction, 827
extractor, 1448
Carbon black:
oils used in manufacture, 953
pelleting apparatus and method, (P) 64
process, new dry-furnace, 1219
production from hydrocarbons, 740
suspensions in oil, 580
U.K. plants, 741
U.S. production, 1008
Carbon dioxide absorption, 833
CO, producing pure, (P) 103
Carcinogenicity of high-boil petroleum products, reducing, 436
Catalysis, 945
and adsorption, 427, 706
enzyme, 1446
for petroleum refining, 947
heterogeneous, 967
kinetics of heterogeneous, 373
olefin oxidation, 88
predictions, 946
Catalysts:
activity, variables affecting, 438
carbon, 804
catforming, 803
oxide, test of some, 572
palladium, 757
recovery device, 407
testing procedure, 449
Cathodic protection, 1372
list methods, 274
pipelines, 1148
Cedar Creek anticline, 169
Cementing wood fibre plates, 1588
Charcoal weight test, 1110
Chemical engineering:
direct-fired heaters, 1536
fundamentals, 427–8
Chemical industry:
pumps:
shaft seals, 1543
symposium, 1542
slurry pumps, 1545
Chemicals from petroleum, 505
China, Yumen field, 173
Chlorine, determination of ionizable, 442
Chromatography for separation of hydrocarbons, 975
Coal:
bituminous, products from Sulcis, 871
boron estimation, microanalytical, 970
briquettes, estimation of pitch content, 1140
chemistry, 864
composition, elucidating, 1138
constitution, 1364
density, charge, 606
genesis, modern views, 1030
influence of surface-active agents, 606
infra-red and X-ray studies, recent, 869
oxidation products, 1231
plastic behaviour, 266
shale combustion rate, 511
ultra-red spectra, 115
Coal tar:
phenol fractions, 1359
pitch and petroleum bitumen mixtures, 602
Coals, potassium absorption of residual, 1249
Coke:
oven, olefin and benzene formation, 1141
plant device, (P) 258
Coking, new data on fluid, 588
Colorado:
Badger Creek permeable sands, 1400
Denver–Julesburg basin, 293
Ignacio quartzite age, 639
Little Beaver permeable sands, 1400
Maroon formation, correlation, 7, 640
Middlemist permeable sands, 1400
Pennsylvanian stratigraphy, 641
problem, stratigraphic, structural, and sedimentation, 769
quartzite, Ignacio, 8
Colombia:
source-bed problem, 14, 652
Velasquez field, growth, 1053
Columbia Plateau, oil and gas, 9
Combustion:
application of statistical studies to control tests, 1461
highways and byways in, 440
nomogram for determination of excess air in, 1325
phenomenon of ejection of burning liquid, 1234
Symposium:
I research, 91
II flow systems, 92
III gas turbine fuels, 93
IV flames, 94
velocities, determination, 434
Combustion Engine Congress, International Internal, 1259
Companies, service, 1388
Computing, electronic, 725
Condensate, oil recovery, 375
Continental shelf, mapping, 1027
Control instruments:
air, dry, 821
all-electric for crude-distillation units, 574
automatic, requirements, 573
bulk oil measurement, 424
combustion of methane to synthesis gas, partial, (P) 220
continuous measurement, control, and recording of fluid viscosity, 963
electronic, 1567
complete, 575
of refinery pumps, 964
v. pneumatic, 1568
elements of some quality, 423
flow, low capacity, 718

Control instruments (*contd.*):
instrumentation, 421
and automatic, in refineries, 961
for continuous analysis, 422
quality control, 719
maintenance, reduced, 818
measuring, 819
metering, crude stream, 426
meters, error curves of liquid, 84
mixing equipment for viscous liquids, 1445
photo-electric, 576
process, electronic, 425
pulsation exploration, 219
quality, 1090
viscosity measurement, new method, 962
Controller, new electronic programmed test-bed, 1342
Cork, thermal behaviour and auto-ignition temperature of powdered, 828
Corrosion:
alloys, cupronickel, 743
amines, boiler injection, 1152
and protection in underground tanks, 1506
by water, refineries and, 874
casing, oil well, 118
cathodic protection:
of pipelines, 1013–14
rectifier stacks, 1012
chemical, in refineries, 872
condenser tubes design to prevent, 1371
conference at Frankfurt, 612
control:
external casing, 1504
in California wells, 272
in gas lift wells, 271
pipeline, 1381
cooling water, decreasing, 1606
damage, testing, 119
de-ethanizer, 92% cut, 120
electrolytic, by differential heating, 873
fretting of copper, iron, steel, 515
hydrogen blistering, 1252
in petroleum industry, 512, 611, 1502, 1605
in ship's plating, 1146
in storage tanks, combating, 1147
inhibitors, 1366
evaluation, 1144
for oil and gas wells, 1145
in refining, molecular weight, 1150
laboratory development, 1368
list of metals, 742
pelleted, (P) 276
solves fouling, 1010
spray-applied, 275
use of, 1251
internal, domestic fuel oil tanks, 746
low-temperature, prevention, 1253
measuring small amounts, 273
neutralizers and inhibitors today, 1369
overcome in gas and gasoline plant, 1154
particles, influence of fine, 1254
pipeline:
cathodic protection interference problems, 1151
control of induced voltages, 747
current fluctuations, 748
current requirements for protection, 1383
inhibitors, 1508
internal control, 1382
underground protection, 1607
prevention:
in cooling water heat exchangers, 1009
Corrosion (*contd.*):
prevention (*contd.*):
in water circulating systems, 1011
metallizing for, 1155
preventive passivation of pipelines, 875
program-control, 1503
protection device for ship's engines, 1507
refinery:
equipment, 744
reducing, 1370
reformer piping, 1608
sea water as coolant, 513
sulphide, cracking of oil production equipment, 745
tank car interiors, preparation, 1375
tanks, cleaning and descaling, 1376
vanadium pentoxide in fuel oil ash, 1157
vapour zone, in sour-crude tanks, 154
well casing by earth current, 1378
Cracking:
catalysts:
benzene production over catforming, 803
butane dehydrogenation, improved, 207
elutriation of finely divided, (P) 76
high-alumina, 1083
iron-reducing process, (P) 76
Platforming, aromatics manufacture over, 412
reforming with carbon, 804
silica–alumina, (P) 76
catalytic:
alkylbenzenes, kinetics, 402
and pyrolytic decomposition of hydrocarbons, 208
catalyst, conveyance of granular, (P) 76
addition, fresh, 73
dehydrogenation, (P) 218
of naphthenes by sulphur dioxide, 205
downflow process, (P) 76
electronic control of Catformer unit, 1443
exothermic reaction process, (P) 209
feed preheat effect, 709
fluid, small scale, 203
hydrocarbons, (P) 209
hydrofining feed stocks, 1557
increase in France, 565
instrumentation, 405
oil recovery from gases, (P) 209
operating the, 708
oxidation, (P) 218
pretreatment process, (P) 76
processes, 1082
production method, (P) 209
reactors, contact, 373
reforming process, selection factors, 949
reforming with in-place regeneration, 1442
thermofor unit, Coryton, 802
ultraforming—low-pressure, 74
vapour-phase reactions, 705, 965, 1096
Zn O production for *sec*-alcohol and ketone dehydrogenation, (P) 209
fluid catalytic:
apparatus, (P) 76
processes, (P) 76
plant:
hyperforming units, design, 410
Orthoflow, catalytic unit, 404
Stanlow hydrodesulphurization, 1559–60
ultraformer, performance, 1555
Cracking (*contd.*):
processes:
aromatization, 1554
asphaltenes, kinetics of coking, 1213
isobutylol contact, 414
catforming upgrades naphthas, 950
coking yields, fluid, 406
conversion, 72, (P) 76:
and quenching, (P) 76
hydrocarbon, (P) 76
dehydrogenating aromatization of saturated hydrocarbons, (P) 209
dieselforming, 948
Houdresid, 1211
Houdriforming, chemistry and technology, 471
hydrocarbon aromatization and dehydrogenation, (P) 209
hydrofining, 1212
hydrogen production, 571
hydrogenation, (P) 77
maintenance and turnaround, 75
modern, 564
moving bed, 1211, 1553
octane, 100 clear, 952
pebble heater, advantages, 408
Platforming, 412, 1084
pollution, stop, 1214
reforming, (P) 77
residuum problems solved, 1552
Rexforming, 951
SO_2 extraction for aromatics recovery, 206
slurry recycle and settling, 1556
upgrading stock by hydrodesulphurization, 1558
thermal:
Association News Conference, 403
cat naphtha, 805
paraffinic fraction, (P) 76
thermofor pyrolytic, 204
See also Catalysis.
Cresol, quantitative determination of water in, 996
Crude oil:
and products, classification, 971
Aramco, 236
Big Horn basin fields, characteristics, 309
consumption, 1617
decomposition, heat of reaction, 1114
evaluation, 1326
free world production, 332–3
gas-charged, unstable filtration, 538
Kansas, evaluation, 1577
mixing, in-tank, 374
Oklahoma, evaluation, 1577
production, 1617
throughput, 1617
Cuba:
Echevarria wildcat, 532
picture, hazy, 137
tertiary sands, 1168
wildcat, 299
Cumene production, 739

Dehydration, natural gas, 847
Dehydrogenation:
Houdry process, 568
process, (P) 77
Delaware, wildcat tests gas, 290
D.S.I.R., petroleum industry and, 1613
Depreciation, 760
Descaling, electrolytic, 1377
Detergency in diesel lubricating oils, 1348
Detergents:
Congress in Paris, first World, 269
synthetic, 863
Dewaxing, *see* Solvent Refining.
Diesel fuels, examination, 1233
Distillation:
absorption and stripping design, 1551

Distillation (*contd.*):
aromatic hydrocarbons, isolation of, 1314
aromatics, nitration grade, 67
ASTM, tag flash *v.*, 561
azeotropic:
and extractive, 394
processes, 797
bubble-cap plate, pressure drop, 192
columns:
assessment of efficiency, 586
combination batch and continuous fractionation, 195
fractional, (P) 68
pulse, 193–4
control, automatic, 560
crude units, all-electric control, 574
curve correlations, 393
data, flash vaporization and ASTM, 1076
droplets in air stream, evaporation, 66
fractional, 1440
column head for, 798
fractionation column, control, (P) 68
heat transfer, 65, 1548
in film evaporator, 941
hydrocarbons, separation of isomeric aromatic, (P) 68
hydrogen chloride from crude oil *v.* salt content, 799
laboratory data, practical proof, 1549
liq–liq extraction, 197
nomographs:
for easy estimating, 942
for Lewis-Matheson calculations, 801
stripping design, 1551
tar, 604
T.B.P. and Engler type, comparisons, 940
tower, liq–liq extraction in a spray, 196
tray design, 1550
turbogrid trays, application, 800
vapour–liq contacting apparatus, (P) 68
Dodecylbenzene from petroleum hydrocarbons, 868
Drilling:
Alberta discovery, 1035
collar, mud-driven drill, 146
coring by rotary, 312
deep, record year, 334
exploratory:
in 1953, 21
in 1954, 1418
in U.S.A., 331
Grass Creek, Wyoming, 543
inclined, principles in Yugoslav practice, 1419
Israel's prospects, 1421
log:
interpretation:
electric, 1516
in shaly sands, 23
logging:
gamma rays, 1291
in thin beds, resistivity, 24
symbols for electric, 1517
offshore, economics, 1043
packer for pressure cementing, 142
pressure gauge, well-bottom, 143
record set, 1269
rotary:
technology, 1285
U.S.S.R. experience, 1285
samples, estimation of sulphate contents, 316
sea bed, 1519
Sinai search, 907
Soviet science technique, 905–6
techniques since 1859, 20
well completed, 26
Drilling (*contd.*):
with nitrogen and micro-hole drilling, 313
Drilling equipment:
annulus tool, (P) 28
bit assembly, (P) 28
cable, small scale mechanization, 902
casing scraper, (P) 28
cement:
hydraulic, (P) 28
slurry, 22
cementing tool, new explosive, 903
collars, big drill, 310
design and manufacture, 659
dual logging unit, 311
Dyson boiler transporter, 1518
exploration, (P) 28
gel–cement and bentonite–oil, 1290
hardening, 25
jet bits, use, 900
line-suspended, safety support, (P) 28
offshore:
economics, 904
structure, submersible, (P) 28
packer, well, (P) 28
perforating guns, multi-shot controller, (P) 28
pipe:
flexible jointed, (P) 28
lowering, 901
rig, (P) 28
mobility, 314
rock bits and their regeneration, 1287
rotary, 1500 m, 1286
scratcher, (P) 28
subsurface well tool, (P) 28
Drilling mud:
cement slurry composition, 1515
emulsion:
lignosulphate stabilized, 1420
lime, 144
multi-purpose, 661
saturated salt water, 771
filtrate, influence, 145
lime-base, 1288
low-solids, 770
methane contents, recording, 1289
non-fluorescing, 772
pumpability of clay–water, 660
Sanok conference, 27
sea water, 1044

East Indies, marine operations, 662
Egypt:
Desert wildcat, 1040
discovery, new, 1271
Feiran No. 2 well completed, 907
Sinai output rising, 1272
Sinai Peninsula, discovery, 1039–40
Elastomers, synthetic, 1132
Emulsion:
studies in water-in-oil, 1099
viscosity and electroviscous effect, 90
Engineering, electrical, 756
Engines:
compression ratios up, 1118
detonation, water injection curbs, 1609
diesel:
maintenance from breakdown, 613
running on low grade fuel, 1384
wear in marine, 851
exhaust gas analysis, 1610
gas:
compresser sets at Coryton, 620
turbocharging 2-stroke, 516
gas turbine:
annular combustion for, 619
British developments, 617
corrosion aspects of vanadium problem, 1156
free-piston, 618, 749, 878, 1015
fuel, running on residual, 1509
Engines (*contd.*):
gas turbine (*contd.*):
reheat for, 1016
using gaseous fuel, 952
v. reciprocal for pipeline construction, 879
heat, 1103
hydrogen, premature ignition, 615
Italian CFR, correlation scheme, 877
jet, combustion efficiency loss, 1120
locomotive, steam shunting, 1235
marine (Doxford), excessive lub oil consumption, 614
oil, tuning high-speed, 983
Otto cycle, alcohol–water injection, 984
stalling behaviour, 121
testing David Brown, 616
wear:
cylinder liners, 1158
diesel,-reduced, 592
journal-bearing, 1238–9
piston ring, measuring, 451
pistons, 1158
quantitative determination, 1496
reduction of cylinder, 994
Enthalpy changes, prediction of isothermal, 721
Equiviscosity index, 1351
Esters, epoxide resin, 1365
Estonia, gasoline composition from oil shale, 608
Ethylene:
manufacture and distribution, 569
oxidation:
direct, 1246, 1600
partial, 509
Europe:
1953 developments, 29
detergents, recent developments, 752
energy, future, 1386
pipelines, new, 545
plastics, recent developments, 752
refining capacity reviewed, 521
rubber, recent developments, 752
Exothermic reaction, 827
Extraction, liquid–liquid, 822

Far East, 1953 developments, 29
Fat, solidifying process, (P) 95
Fire:
fighting equipment, 282
protection, automatic, 1255
research (1953), 525
See also Safety Precautions.
Fischer–Tropsch process:
CO_2 injection, (P) 218
pilot plant, fluid catalyst, 1223
research, 1224
synthesis:
hydrocarbons, 85
recent developments, 956
using a fluidized cat, (P) 218
wax formation on the cat, (P) 218
Floor adhesives, 1130
Florida:
cenozoic sediments, 887
exploration, 1266
oil possibilities, 626
refraction work, 1283
Flow, more data on 2-phase vertical, 583
Flowmeter, subsurface, 1186
Fluids, flow and measurement, 376
Formosa, gas search pushed, 654
Fourth World Petroleum Congress, papers, 1258
France:
Aquitaine, geophysics in exploration in, 658
cat cracking increase, 565
exploration at Haute–Alsace, 285
ostracods in Paris basin, 894
output record, 346

France (*contd.*):
Parentis:
field, 534
find, 777
Rhodanian Couloir, investigations, 895
sedimentological publications, 1412
Friction:
losses, 376
recent studies of metallic, 826
Fuel:
and power research, 1387
gasification, sulphur reaction, 267
pump with plain plunger, Tangye, 621
research (1953), 430
tanks, explosive limits in aircraft, 986
Fuel oil:
agriculture, progress review, 753
ash, corrosion, 1157
atomizer, air blast, 465
central heating, 988
desulphurize, how to, 712
diesel, additive, 592
distillate, doped, (P) 241
distribution and use in U.K., 462
doped, (P) 241
emulsions of water in, 1570
examination, microscopic, 589
firing in central power stations, 1615
flue gases, SO_3 content, 464
heavy, gasification, 1582
horticulture, progress review, 753
industrial, wider use, 279
injection problems, 849
production, (P) 106
purification of heavy, 104
recovery, Pledger plant, 848
residual:
flow properties, 1581
problem in Italy, 190
sulphur removal and recovery, 463
Fuelling, aircraft hydrant, 1197
Fuels:
additives, 251, 1119,
aircraft, combustion and aniline gravity product, 1463
alcohol with normal diesel, 850
and power, German resources, 1616
colloidal, 1499
combustion, Symposium, 91–4
diesel, low grade, 1384
distillate, additives improve, 987
engine:
and knock, 982
crude purification for, 460
deposit formation in spark-ignition engines, 461
diesel, 1233
past, present, and future, 1459
gas:
non-luminous device, (P) 238
production, hot-burning, (P) 238
gas turbine, aircraft, 1340
gaseous, sampling and testing, 839
key to road performance, 1116
jet liquid, 823
liquid, 823
atomization, 1465
burning installations, 240
progress in synthetic, 1566
liquid gas, determination of non-hydrocarbon gases in, 837
low-cost, in motor ships, 985
motor:
stability, 1464
trends, 1117
vapour-pressure levels, 1580
petrol, knockproof, (P) 106
research on synthetic liquid, 268
residual, values and, 981
rocket, testing, 1456
synthetic liquid, research, 124
Fuels (*contd.*):
turbojet, efficiency at high altitudes, 1578
vaporization phenomena, 1329
2, 3, 4, 5-bis (Δ2-butenylene)tetrahydrofurfural, (P) 265

Gases:
by-products, illuminating, (P) 112
C_2H_2 separation, (P) 238
CO and H_2, detoxicating, (P) 238
CO-containing, detoxication, (P) 238
dehydration:
1954 methods, 459
wet, 102
drying process, (P) 103
dynamics of gasification, 1336
flow:
analyser, 48
calculations, 1191
from Lacq deposit, composition, 1337
hydrocarbon, viscosity under pressure, 151
industry looks to continued growth, 844
LPG sales increase, 1115
mixtures, separating, (P) 238
plant, catalytic oil, 591
production:
CO-poor town, (P) 238
costs, determination, 1614
synthesis:
from ballast-rich fuels, (P) 238
production from pulverulent fuels, (P) 238
testing of "LPG" and similar hydrocarbon, 840
town, detoxicated, (P) 238
town's gas production, 458
Gasification, granular to pulverulent fuel, (P) 238
Gasoline:
antioxidants for, (P) 239
blending stocks, 233
chemical composition, Estonian oil shales, 608
consumption, 1120
gum inhibitors, (P) 239
halogens in ethyl, determination, 444
octane:
numbers, time-saving method, 1328
ratings of motor, in Yugoslavia, 1460
octanes up, 1118
refining in vapour-phase, 409
research, 386
shale-oil, stability of, 843
stability, predicting, 1462
utilization, 980
vapour lock, 1579
volatility in relation to vapour lock, 1579
Gasoline plant:
Banquette, 395
Ventura expansion, 398
Geophysical surveying:
Aquitane, in, 658
current methods, 303
exploration:
by electric pulses, (P) 19
trends, 1280
explosive charges, complete detonation, (P) 19
fracture, locating zones of, 304
Gauss theory, application, 899
geochemistry of subterranean waters, 1281
gravitational methods, 537
Hastings field, 1042
hydrochemical studies, 898
indicator, new geochemical crude and gasbearing, 307
Geophysical surveying (*contd.*):
magnetic methods, 896
magnetometer, mobile, 305
mapping with reflection seismograph, 657
maps, geochemical contour, 141
Potok anticline, seismic cross-section, 1284
refraction work, 1283
Sandusky field, 1175
scale model studies, 306
scintillometers, airborne, 897
seismic:
data, 1417
methods, 1513
transducer, parachuted radio, (P) 19
seismographic development in U.S.S.R., 18
tape recorders, magnetic, 1041
Texas, problems, 308
Vealmoor field, 1174
well-logging methods, 1514
wells, 25 years of geophysics, 1512
Georgia:
Cenozoic sediments, 887
petroleum geology, 288
Germany:
corrosion conference at Frankfurt, 612
discovery in Bavarian foothills, 301
drilling and refining expansion, 778
exploration at Baden, 285
fuel and power resources, 1616
patent literature, bituminous materials, 1352
sedimentation since 1949, review, 1409
standards, sweet petroleum spirit, 504
standards (draft):
chlorine, determination of ionizable, 442
flow point and drop point, determination, 443
wells tested, 140
West, increased production, 751
Gilsonite, 1595
Grease, *see* Lubricating Grease.
Great Basin, oil and gas, 9
Greece, oil-bearing areas, 302
Guldberg rule, corrected, 228

n-Hexane in liquid phase, volumetric behaviour, 836
Honduras, oil search, 1169
Houdriforming, chemistry and technology, 411
Humine development, 1250
Hungary, gas field, 1173
Hydraulic oil, (P) 264
Hydrocarbon mixtures, process for obtaining olefin-rich, (P) 112
Hydrocarbon systems, equilibrium ratio charts, 1109
Hydrocarbons:
aromatizing, (P) 112
arrangement, 429
branched, sound velocity in, 1229
conversion process, (P) 76
dehydrogenating, (P) 112
determination of aromatic, 835
estimating unsaturated gaseous, by anodic halogenation, 585
O_2-containing, process, (P) 114
paraffins, producing chlorinated, 738
production, (P) 264
separation:
advances in, 830
chromatography for, 975
synthesis and properties, 1102
tar, cracking, 607
Hydrodesulphurization upgrades crudes, Gulf, 1316
Hydrofining, distillates by, improving, 1330

Hydrogen :
  blistering, 1252
  production, 1597
Hydrogen cyanide from natural gas, 845
Hydrogenation :
  CO :
    on CO cat process, (P) 77
    process for cat, (P) 210
  catalytic production of ammonia, methanol, and liquid fuels, 1215
  Hydrofining, 416
    middle distillates, 566
  hydrogen from petroleum and natural gas, 954
  Fe cat, producing, (P) 210
  pressure process, (P) 77
  refining, of hydrocarbons, (P) 77
  residues of coals, tars, and mineral oils, processing, (P) 210
  shale oils, 415
  transformer oils from shale oils, 415

IFP–PTT apparatus, 1342
Illinois, Loudon project paying off, 542
Inhibitors :
  corrosion, 1366
  for lubricating oils, synthesis, 1346
  mould, 1360
India :
  oil :
    potential, 1432
    prospecting in Assam, 1406
  Trombay refinery, 938
Instrumentation, *see* Control Instruments.
Instrumentation conferences, U.S., 577
Insulating oil, 259
  breakdown strength, 1245
  dielectric behaviour, 497
  dielectric loss, 1006
  measurement of the dielectric strength, 260
  operational assessment, 496
  reclamation, 261
  regeneration, 562
  specifications, trends in early, 1585
Intermountain region, U.S.A., oil and gas, 9
International flame radiation research committee, 435
International Internal Combustion Engine Congress, 1259
Ion exchange symposium, 838
Iraq, Rumaila starts production, 892
Iron, carboxy*cyclo*pentadienyl (*cyclo*pentadienyl), (P) 265
Isomerization :
  mineral oils with hydrogenation catalysts, 1565
  processes, (P) 80
  xylenes, petroleum, 1563
Isothermal enthalpy changes, prediction, 721
Israel :
  drilling prospects, improved, 1421
  exploration, 1171
  gas find, 1404
  geological and geophysical work, 139
Italy :
  discovery at Pescara, 1276
  fuel problem, residual, 190
  Mantovana refinery, 1063
  natural gas, production increase, 1338
  oil in, before the 20th century, 1188
  petrochemicals industry, development, 1137
  sedimentological publications, 1414
  strikes, recent, 1277

Japan, sedimentology, 1407

Kansas :
  correlation of insoluble residue zones, 764
  crude oil, evaluation, 1577
  exploration, increased, 1166
  Florena shale (Permian), 1399
  Jurassic rocks, 763
  pipeline completed, 1195
Kerogen rocks, nitrogen content, 1601
Kerosine recovery, Pledger plant, 848
Ketones from petroleum, 1247
Kinetic data :
  interpretation, 1225, 1319, 1571
  precautions, 1097
Knock committee, IFP, 1343
Kuwait, test hits, 1270
Kuwait–Saudi Arabia Neutral Zone :
  Arab Zone dry, 1038
  Wafra field, 171
    productive, 653

Laboratory, mobile, 979
Legislation in 1954, U.K. petroleum, 1025
LPG recovery, Pledger plant, 848
Liquids :
  determining fl. pt., (P) 235
  resistance to flow over solids, 581
Locomotive, oil-fired geared steam shunting, 1235
Louisiana :
  Cotton Valley group of Upper Gulf Coastal Plain, 632
  exploration, 1267
  Lewisburg typifies multiple-pay fields, 1032
  Mississippi Delta, ecology of foraminifera in SE, 1394
  Moodys Branch–Cockfield contact, 625
  pipelining through marshes, 1061
  wildcat gas, 132
Lubricant :
  additives, 251, 1119
    for petroleum, 473
  and grease plant, 856
  antioxidant composition, (P) 254
  bearings, for roller, 1349
  boiler oil for reduction of cylinder wear, 994
  composition, and engine wear, 246
  cutting, measurement of effectiveness, 1493
  diesel engine, 486
  doped, (P) 254
  evaluation for cold rolling of brass, 249
  fluorine-containing, 1123
  for gas turbine-engined transport aircraft, 1340
  for regenerating cellulose yarns, (P) 254
  for small two-stroke engines, 1470
  formula, (P) 254
  friction, boundary, 466
  gear, testing and selection of 1345
  Hertz loads for E.P. oils, determination, 1451
  industrial, operational handling and storage, 109
  literature, 1953 digest, 253
  metal-forming, laboratory evaluation, 482
  metal-working, 735
  new grease plant, Vacuum's, 857
  oil, radiant heating, 1483
  research methods, 1467
  solid film, friction and fretting with, 1487
  synthesis of detergent additives, 1347
  synthetic, 107
    evaluation tests, 1452
    review, 250
  testing for lubricity, 1476

Lubricant (*contd.*) :
  tests, planning of service, 1584
  viscosity behaviour, 855
  viscosity–shear characteristics, 1475
  wire drawing, 476
Lubricating equipment, 51
Lubricating grease :
  base, oxidized petroleum wax as, 469
  bearing, evaluation of wheel, 248
  complex, analysis, 722
  demonstration of flow type, 1486
  developments, 470
  equipment, choosing, 1125
  estersils (thickening agent), 1485
  formula, (P) 254
  manufacture :
    at Birkenhead, 1242
    modern, 728, 991
  performance and testing, 468
  plant, a new, 1124
  soap :
    content, determination, 1322
    determination, 995
  structure in relation to performance, 1474
  synthetic aircraft, 1478
  testing, 972
  thickeners, substituted ureas as, 247
  Vacuum's new Birkenhead plant, 1241, 1469
  viscosity, measurement, 1455
Lubricating oil :
  ageing resistance, apparatus for determining, 584
  all-season high performance, 853
  Canadian plant, 990
  chlorofluorocarbon oils, properties, 1240
  cutting fluids for machining operations, 252
  detergency in, 1348
  E.P. additives for, (P) 254
  engine requirements, automotive, 242
  extraction, solvent, 996
  film extent in journal bearings, 1239
  fluorescence, 447
  foaming of heavy-duty, 1489
  formula, (P) 254
  identification of Pennsylvania, 594
  light, production process, (P) 264
  mineral, (P) 254
    infra-red spectrometry in analysis, 973
  mist, explosion characteristics, 593
  motor :
    analysis of multiple-viscosity, 1573
    designing performance into, 472
    engine cleanliness, 1586
    IOW-30, 445
    U.S. trends, 854
    value of the " new," 471
    viscosity of multigrade, 1497
  petroleum residue as source, 1122
  photographic research, 590
  reclamation of used, 483
  rust preventives, surface-active, 485
  sludge, 1350
  solvent extraction, 1210
  spinning, scourability test, 100
  steam turbine, for severe conditions, 730
  study, 448
  synthesis of inhibitors and additives for, 1346
  tests, 245
  transformer, electrical strength of, 1498
  viscosity of car-journal oils, 1238
Lubrication :
  automotive front wheel bearings, 1488
  bearings, rolling, 1583
  board mill in Africa, 1480

Lubrication (*contd.*):
  developments, review of, 1236
  gears, 244, 1583
    drives, industrial, 477
    failure, examples, 474
  hydrodynamic, 1482
    of roller bearings, 992
  literature, 1953 digest, 253
  marine, 596
  mixed friction conditions, 1479
  notes, 1344
  planned, Steel Company of Wales, 478, 595, 729
  points, 51
  problems, 1237
    in road transport, 1468
  production plant, modern, 1471
  recent advances, 1466
  roller bearings, hydrodynamic, 108
  science and, 989
  sludge formation in passenger-car engines, 993
  surface failure in gears, 475
  systems:
    forging presses, 479
    machine tools, 243
  terms, tentative glossary, 467
  wear in bearings, 481

Malaya, oil berths at Singapore, 680
Manitoba, wildcat, 135
Maps and mapping. *see* Petroleum Geology.
Melchett Lecture for 1952, 440
Mercaptans, removal during refining, 550
Methane, conversion with oxygen, 814
Methanol production, 1215
Mexico:
  Gulf field found, 1395
  Pemex strike made, 298
  wildcats, 341
Michigan:
  basin:
    geology of, 635
    promise, 335
  pipeline completed, 1195
Middle East:
  Aramco crude, 236
  1953 developments, 29
  production increase, 343
Mineral oils, structure of soap dispersions, 1323
Mississippi:
  embayment:
    geologic investigations, 6
    geology of, 636
  Warrior basin stratigraphy, 292
Monomolecular films of mixtures, 1098

Naphtha, cracked, pure aromatics from, 861
Natural gas:
  accounting for gas purchases, speed, 727
  acetylene from, 726, 1133
  behaviour, 150
  Canadian discovery, 1268
  dehydration, 847
  –glycol systems, equilibrium dew points, 1598
  hydrates, conditions for formation, 1458
  hydrogen cyanide from, 845
  line in Rhine–Main area, 1434
  Pakistan find, 1274
  pipelines, 880
  pressures, calculation of bottom-hole, 1177
  production increase, Italian, 1338
  report on adaptation for domestic appliances, 846
  Texas reserves, 1300
Neutralizers and inhibitors today, 1369
Nevada, dolomites in Silurian and Devonian, 643
New Brunswick:
  Cod County oil search, 890
  oil flows, 1403
New York and Ontario, stratigraphy of Medinan group, 646
Nigeria, test, deep, 1273
Nitrogen, content of Kerogen rocks, 1601
Noise insulation, 1355
N. Dakota:
  drilling expands on Nesson anticline, 673
  Mandan refinery, 685
  Williston basin:
    exploration, 633
    mud solves problem, 771
    paleozoic unconformities, 634
    stratigraphy, 291

Ohio:
  lesson of world's deepest well, 1167
  pipeline completed, 1195
Oil:
  and resins, structure, 117
  gas plant, catalytic, 591
  pollution of the sea, 757
  price in W. Europe, 1021
Oily industrial wastes, 283
Olefins:
  effect on road octane no., 1339
  properties of, 1228
Oklahoma:
  Anadarko basin's promise, 289
  Burbank floods promise, 674
  Chikasha gas field, 1033
  crude oil, evaluation, 1577
  Oil Creek sand, 133
  Pennsylvanian conglomerates, structure, and orogenic history of L. Classen area, 762
  pre-Cambrian surface, 1398
  Simpson group discovery, 294
Ontario:
  Elk basin discovery, 336
  leaching of Silurian salt beds, 891
Oregon:
  Big Horn basin, 297
  Idaho border wildcat, 766
  producing zones, 296
  wildcats, 1402
OEEC interim 1954 report, 524
Oxidation:
  biological, of soluble oil emulsions, 1495
  n-butane, 431
  ethylene to ethylene oxide, 1600
  fuel vapours and gases, 452
  inhibitors, (P) 254
  LPG to chemicals, 1315
  mineral oils, 433
  oils, used, 1564
  *iso*propanol, 829
OXO process:
  alcohol production, (P) 218
  catalyst injection, (P) 218
  synthesis, its kinetics and related reactions, 1321

Paint, silicone-based, 62
Pakages, comparison of foil, 1260
Pakistan:
  gas find, 1274
  oil:
    and her development, 344
    production, 37
      from Upper Tertiary fresh-water deposits, 671
    prospecting, 1406
  Sui–Karachi gas pipeline, 1062, 1196
Paraffins:
  foam point above, 432
  solidifying process, (P) 95
Paving mixtures, rubber–asphalt, 493
Peat:
  dehydrating plant, (P) 83
  symposium, international, 116
Pennsylvania gas field, 167
Persian Gulf, underwater oil search, 315
Peru:
  failure of tests, 138
  reserves, N. coast, 767
  Salinas oil sand, 1170
Petrochemicals:
  acetylene manufacture, 813
  acrylonitrile production, 510
  developments, 506
    and prospects, 960
    review of recent, 758
  England's giant, 1361
  ethylbenzene and *iso*propylbenzene, importance, 866
  LPG from, 507
  pesticide, 508
  plants, 880
  recent developments, 812, 1089
  separation methods, three new, 1065
  syndet manufacture, 865
  U.S. statistics, 505
Petroleum:
  acetylene from, 1133
  economic progress, sidelights, 1256
  industry:
    and D.S.I.R, 1613
    economics of international, 1257
    overseas' requirements, 754
  nature and composition, 1569
  porphyrins in, properties of, 237
  products, blended light, 439
  rubber industry and, 609
Petroleum geology:
  Africa, in Equatorial, 1405
  age of Franciscan group, California, 644
  Anadarko basin's east flank, 289
  Arizona well completed, 638
  Arkansas prospect, 1164
  Assam, 1406
  Association News, 286
  Australian:
    discovery, 1275
    exploration plans, 300
    gas flows, 533
  bacterial strains, application, 884
  Baden, 285
  Bengal, 1406
  Bergton gas field, 1392
  Big Horn basin, 297
  Boling salt dome, 5, 628
  calcareous formations, 1390
  Cambrian pay in W. Texas, 130
  Canadian Arctic islands, possibilities, 651
  cardium formation, 889
  cenozoic sediments, SE. U.S., 887
  Chikasha gas field, 1033
  coal measures, U.K., 15
  Colorado:
    Ignacio quartzite, 639
    Pennsylvanian stratigraphy, 641
    permeable sands, 1400
  Continental Tertiary deposits in intermountain region of U.S.A., 637
  Corcoran clay in San Joaquin Valley, 645
  Cotton Valley group of Upper Gulf Coastal Plain, 632
  Cretaceous and some Triassic beds of British Columbia, 649
  Cuba:
    exploration, intensified, 532
    hopes, 299
    picture, hazy, 137

Petroleum geology (*contd.*):
Dalhart basin, 531
Delaware basin wildcat tests gas, 290
Denver–Julesburg basin, exploration, 293
diagraphy, instantaneous, 126
discovery in SE. States of U.S.A., 287
dolomites in Nevada, 643
Dora Roberts trend, 886
drilling:
Oklahoma, 294
record set, 1269
Echevarria wildcat, 532
Egyptian discovery, 1271
Ellenburger production, 885
exploration:
Honduras, 1169
Louisiana, 1267
Texas, 1263
fault patterns, 1261
Florena shale (Permian) of Kansas, 1399
Floresville–Stockdale trend, 1165
Florida, exploration, 1266
Formosan gas search pushed, 654
Four Corners region, Pennsylvanian stratigraphy, 641
France, show in SW., 1172
gas, time of migration of oil and, 1391
field, Hungary, 1173
find, 1274
Israel, 1404
Georgia, 288
German discovery, 301
glauconite formation, 1389
Gulf field found, 1395
Haute-Alsace, 285
hydrocarbons of Uinta basin, origin, 642
Ignacio quartzite, Colorado, 8
Intermountain region, 9
investigations:
in Rhodanian Couloir, 895
in Rumije, 16
Israel, 139
exploration, 1171
Italian discovery, 1276
Jurassic rocks in Kansas, 763
Kansas, exploration, 1166
Kuwait test hits, 1270
Late Devonian history in Stettler area, 647
leaching of Silurian salt beds, 891
lesson of world's deepest well, 1167
Lewisburg field, 1032
limestone rock, spectrograph for correlation of, 1161
lithofacies relationship, 1397
Louisiana wildcat, 132
Lower Silurian deposits in U.S.A. and Canada, map, 761
magnesium–calcium ratios, 1390
mapping the Continental shelf, 1027
maps, regional subsurface, 1026
Maroon formation:
correlation, 7
in Colorado, 640
Michigan basin, 635
Midland basin, Texas, 630
minerals in rocks, quantitative analysis, 1029
Mississippi:
Delta, ecology of foraminifera, 1394
embayment, 6, 636
Missouri stratigraphy, Kansas, 764
Moodys Branch–Cockfield contact, 625
Muldoon field development, 1162
natural gas discovery, 1268
Nigerian test deep, 1273
oil:
and gas, time of migration, 1391
bearing areas in Greece, 302

Petroleum geology (*contd.*):
oil (*contd.*):
factors affecting accumulation, 1510
flows in New Brunswick, 1403
from every age, 1265
in English coal measures, 656
possibilities in Florida, 626
resources, Texas', 1262
Oncala anticline, test, 536
Ordovician stratigraphy in W. Texas, 631
Oregon basin producing horizons, 296
origins of hydrocarbons, Uinta basin, 10
ostracods in Paris basin, 894
paleogology of Panhandle of Texas, 1393
Paradox Salt basin, Pennsylvanian stratigraphy, 641
Parentis well, second, 534
Pemex strike made, 298
Pennsylvanian conglomerates in Oklahoma, 762
Permian basin rewards, 1264
Peru, Salinas oil sand, 1170
petrography of sedimentary rocks in U.S.S.R., 1416
petroleum formation, rôle of bacteria, 4
potentiometric models, operating, (P) 17
pre-Cambrian in Oklahoma and adjacent States, 1398
Raton basin, 531
reefs of Woodbend group, Alberta, 768
reserves, Peruvian search, 767
reservoir pressures, Gulf Coast, 131
rocks, shaly reservoir, 125
Rough Range discovery, 655
salinities in relation to tightness of cover, 893
salt dome:
new phase, 627
record set, 1163
sample analysis, 1390
sands, Cuban tertiary, 1168
Sara—largest Devonian structure, 129
sedimentation:
deep-sea, 883
recent, 284
sedimentological publications:
Belgian, 1408
Danish, 1410
French, 1412
German, 1409
Italian, 1414
Japanese, 1407
principal, 1413
Spanish, 1415
Swedish, 1411
sediments:
characterizing, 2
for pollen analysis, preparing, 1028
recent marine, 12
Sicilian field expands, 1278
Sinai output rising, 1272
source-bed problem in Velasquez field, 652
southern Mackenzie basin, 650
Spanish test at Castilfrio, 535
spectrograph for correlation of limestone rock, 1161
stratigraphic problem, Beaver field, 769
stratigraphy of Medinan group, 646
Strawn sands production, 629
strike, Dora Roberts ranch area, 128
strikes, Italian, 1277
survey, surface, 3
Switzerland, 285
terminology, 1396
test dry, Peru, 138

Petroleum geology (*contd.*):
Texas offshore strike, 127
trace metals in W. Canada crude, 648
turbidity currents, 623
undeveloped provinces, 1031
uranium with associated hydrocarbons, relationship of, 624
U.S.S.R. science and technique, 1279
Utah, Pennsylvanian stratigraphy, 641
Wafra field productive, 653
Warrior basin stratigraphic problems, 292
Wasatch Plateau gas fields, 1401
waters of the lower chalk, 1292
wells tested, German, 140
wildcats:
Oregon, 766
four Canadian, 135
in E. Canada, 890
wildcatters in Washington and Oregon, 1402
Williston basin, 633
Devonian system, 1511
discovery, 291
paleozoic unconformities, 634
world:
deepest well dry, 1034
oil prospects, 622
prospects, 1
Wyoming discoveries, 295
Phenols, paper chromatographic separation of, 1107
Photography in oil research, 455
Pipeline:
Aden to Little Aden, 789
Alaskan, 360
A.S.A. code for pressure piping, 546
automatic control for gas, 919
bevel, 30° pipe, 1194
blending products, 1192
blowdowns, gas, 357
bridge:
wind vibration and cure, 785
world's longest suspension, 684
buried:
electrical protection, 1380
measuring electrical conductance of coating, 1149
Californian case histories, 1435
cathodic protection, 1148, 1372
current requirements, 1383
interference problems, 1151
cleaning, 52, 1433
coating:
cold applied coal tar, 783
with plastics, 1379
concrete, cast-in-place steel-cored, 176
construction, engines for, 879
corrosion:
control, 1381
inhibitors, 1508
internal, 1382
preventive, 875
crude, 788
crudes, for highly viscous, 348
Denver–Julesburg expansion, 337
design, 40, 174
for non-Newtonian fluids, 189
developments, production and materials, 1193
electricity in pumped gasoline, 1436
electronics, new features, 784
Emsland, 47
European, new, 545
expansion (1955), 779, 917
failures due to hydrogen blisters, unusual, 681
filtering, 350
practices, 782
gas:
centrifugal compressors for, 1190
economic design factors, 781

Pipeline (*contd.*):
flow:
calculations, network, 1527
temperature, 41
hydraulic conveying of solids, 1060
hydraulics, 177, 351–3, 786, 1058
hydrogen blisters, prevention, 780
instrumentation, 1095
laying methods, advanced, 43
Magnolia's new Corsicana–Beaumont, 358
maintenance and testing, 359
natural gas, Rhine–Main area, 1434
offshore, world's longest, 918
operation, bringing into, 178
Panhandle main completed, 1195
P.V.C., rigid, 547
pressure:
drop proved, predicted, 683
loss, 349
relief, designing, 1526
Saskatchewan crude, for, 42
service, construction record, 787
slurries, flow of sand–water, 1059
spraying, internal, 1303
station design, 174
Sui–Karachi:
construction, 1196
gas, 1062
telemetering system, 1304
testing, 52
Texas mileage, 1525
through Louisiana marshes, 1061
turbocharger installation, exhaust-driven, 45
ultrasonics, practicability, 43
underground, protection, 1607
upkeep cut, 1528
voltages, controlling induced, 747
warehousing on a products, 179
weld inspection, 920
welding and coating, 46
welds, radiographic inspection of, 356
wrap, polyethylene tape, 355
Yellowstone products, 354
Plastics:
chemical resistance, 1603
in perspective, 1604
review of developments, 1602
selection, 1101
Poland:
Krosno meeting, 912
petroleum industry, 522–3
Potok anticline, seismic cross-section, 1284
Pollution, 1208, 1214
Polymerization:
diolefin–mono-olefin mix, (P) 78
guided, of ethylene and its homologues, 806
hydrocarbons, derivative, 1561
process, (P) 78
for drying oils, (P) 78
wax from ethylene, continuous process, (P) 78
Polymers, influence on carbon black suspension in oil, 580
Polythene, Canadian plant, 1599
Polyvinyl chloride, unplasticized gear, 1374
Pools, spread of liquid, 89
Potassium absorption of residual coals, 1249
Production equipment:
dye-photo tool, 153
electrical, Venezuelan, 328
flowmeter, subsurface, 1186
pump, well bottom, 318
pumping, applications, 667
Rumanian pumping, 325
spanners, mechanical, 325
summary of documentation, 317
Production equipment (*contd.*):
tool for perforating casing below tubing, 773
tracers, radio-active, 1046
viscosimeter, rotational high pressure, 666
well pumps, (P) 39
Production of petroleum:
acidizing gas producing wells, 152
Big Mineral field exploitation, 672
Borneo's quest for oil, 677
boundary between oil and water, calculating, 38
bubble formation in oil recovery, 774
Burbank floods promise, 674
California, in, 675
capillaries, displacements in microscopic, 36
Cedar Creek anticline, 169
Chinese field, 173
composition for recovering lost circulation, (P) 39
Creole's conservation plans, 1429
crude, problem of unstable filtration of gas-charged, 538
deposits of W. Pakistan, 37
developments (1953), 29
displacement of oil from porous media, 775
drilling, effect of drain hole, 1180, 1182
East Texas Woodbine cores, 1424
electrification, development, 908
engineering progress, mechanical, 147
Eocene, 339
equation, simplified form of the material balance, 1048
estimating reserves, 29
exploration, 330
flow, calculating unsteady, 323
fluids:
in porous media, 1298
resistance to flow in natural gas wells, 665
fractures:
effect on:
production capacity, 1294
secondary recovery, 320
induction and extension, 154
treatments in Permian basin, 1297
fracturing:
at high injection rates, 1425
boosts production, 164
veteran field, 319
free world, 332
gas:
flow, analysis, 32
hydrates, 148
injection:
improves recovery, 541
in a Frio sand, 33
processing on oilfields, 31
slip, effect, 149
well performance curves, calculation of stabilized, 1422
gas well, temperature surveys, 1521
German expansion, 778
Germany's increase, West, 751
Golden Spike field, development, 913
India's oil potential, 1432
influx of oil and bottom water, incomplete well, 1179
injected fluids, encroachment, 1427
injection into oil reservoirs, preparation of water, 1295
isotopes for water-input profiles, radio-active, 670
Kafarov's method, 911
Krosno, association activities, 912
lateral hole drilling effect, 1182
Leduc discovery, 1523
Loudon project paying off, 542
Production of petroleum (*contd.*):
magnetic susceptibility measuring apparatus, 156
natural gases, behaviour, 150
Nesson anticline, drilling expansion, 673
Nottinghamshire oilfields, 329
oil:
from sand, 326
recovery performance, 1045
sands of Alberta, 1317
oil-bearing contours, displacement, 910
oilfield, Californian textbook, 166
paraffin sedimentation, 327
Pembina field, 170
Pennsylvania gas field, 167
permeability, measurement of relative, 322
planning, new measuring methods for, 1047
plants for preparation of water for injection, 1296
plastic products, summary, 1367
plugging water, fractured formations, 34
porosities, measurement of fissure and macropore, 1293
porous media, determination of capillary properties, 35
pressure maintenance by inert gas injection, 1176
pressures, calculation of bottom-hole, 1177
productivity increases, well, 1181
programme, co-ordinated, 1520
pump testing, self-priming centrifugal, 668
pumping, deep well, (P) 39
Ragusa field, 914
recovery boosted with high-pressure gas, 163
reservoirs:
defining water tables, 669
engineering, letter symbols, 1051
fracturing, 321
measuring parameters, 160
performance:
predicting, 161
of water drive, 1423
prediction of behaviour, 159
pressure in bounded, 324
water-driven, 162
Rumaila start, 892
Rumania, new crude area, 915
Salt Creek's low-gravity oil, 541
sand control, 158
secondary recovery, Tijerina reservoir, 1428
shale oil, 549
Shannon reservoir, 1522
Sicilian:
field expands, 1278
wells, 172
Sinai output rising, 1272
slant hole drilling effect, 1182
Slick–Wilcox field, 1430
stimulation, low-cost method, 663
Sumeeani field, exploitation problem, 678
supersaturation during oil flow, 157
Texas' Cambrian trend, 168
tracer in water-flooding operations, 155
undersaturation during repressuring, 157
U.S. west coast optimism, 676
Wafra field, 171
water-drive:
field, analysing, 165
process, 1178
water flooding:
at Loudon, 542
economics, 1183

Production of petroleum (*contd.*):
water flooding (*contd.*):
efficiency in oil-wet systems, 1185
experimental, 540
water injection:
preparation, 909
wells, injective capacity, 1426
water source and requirements, 1049
well completions:
for water flood operations, 1050
permanent type, 539
well fracturing effect on water flood, 1184
well treatments, optimum sand concentrations, 654
wells which respond to stimulation treatment, 1299
Products, gamma-radiation and finer oil, 1574
Propane, liquid, water solubility in, 977
Propylene, preparation from *iso*propyl alcohol, 113

Radioactivity, 1111
Ragusa asphaltic rock, 494
Reclamation, used oil, 1481
centrifugal purification, 1490
crankcase, 1491
Refineries:
Aden, 689
British Columbia plant on stream, 796
Canadian Petrofina Ltd., 1308
capacity survey, 1020
cleaning programme, 1531
construction survey, 1019
Dakota, 55
Esso's Hamburg, 548
expansion prospects, 880
fuel-supply situation, changing, 881
Humble's Bayton, 821
Mandan, 685–8
Mantovana, 1063
Minnesota, 55
Trombay Is., Burmah-Shell, 938
Washington, Ferndale, 795
Wisconsin, 55
world's most spectacular, 1437
Refinery plant:
air ejectors, 388
boilers, use of residual fuels, 791
bubble caps, slot openings, 1538
burner for gaseous fuels, 559
cascade control columns, 1064
cathodic protection, 1372
centrifugals, 1532
column:
fractional distillation, (P) 68
packed rectifying, 187
condenser tubes, 1371
control, automatic:
electrical, 1092
installations, 109
cooling liquids, finned coils for, 224
corrosion by H_2SO_4 and H_2SO_4 sludges, 744
crude pipe still, Sisak, 56
crystals of organic compounds, purification, (P) 64
design, flexible, 693
electric motors, protection, 1200
expansion, shut down obviated, 1305
filters, 1532
for tropical and sub-tropical areas, 183
fractionator testing, 698, 790
furnace:
burner performance, 558
performance, 701
gasoline, 395
enlarging, 551
gauges, unilateral thickness, 554, 702
heat engines, 1103

Refinery plant (*contd.*):
heat exchangers:
aluminium alloy, 691
costs, 186
extended surface type, 690
maintenance, 1199
surfaces, pin-fin, 1203
high-pressure equipment for chemical engineering processes, 385
hydroformer, Destrehan fluid, 1220
inhibitors, organic, 1153
lead " bronzes " in refitment economy, 930
leakage, hydrogen in cooler and condensers, 703
maintenance, 927, 1077, 1198
materials and construction report, 379
moisture reduction, (P) 64
Monotower crane, 699
packing problems, solving, 936
pelleting apparatus, (P) 64
perforated plates *v.* bubble caps, 1067
phenol, at Richmond, California, 61
piling, concrete, 60
pin-fin heat-exchanger surfaces, 1203
pipe, long-term creep, 1373
power allocation, 1306
pressure vessel:
design, 552, 1073
safe, 1311
operation, 1074
protection of cooling tower wood, 929
pumping applications, submersible, 1201
pumps:
centrifugal acid, 1544
cost of installing centrifugal, 1547
proportioning, 1207
rate of centrifugal, 1546
specification work, cut, 1069
stations, design, 1439
reactor, (P) 64
fluidized bed, 1319
recycling tray, 390
Redwood steam treaters, 63
replacement problems, 1530
screens, wet, 1532
size and unit costs, 1248
sizing future process vessels, 1206
stack costs, estimating, 1309
start-up time cut, 1070
steam-driven, for process heat, 1535
stop valves, design, 934, 1075
stresses in branch connexions, 792
stripper design, new, 1312
tank costs, rubber-lined, 935
tower:
anchorages, design, 58
internals, 692
packing, new mesh, 1204
towers, how to calculate multi-draw, 1205
trays, perforated plate, 931
tube design, practical finned, 700
turbogrids, 380
Uniflux fractionating tray, 389
unit operations and fundamentals review, 1068
Uniflex trays, 1537
V_2O_5, technical problems about, 1320
valves:
design of balanced stop, 696
new type, 382
plastic, 1313
relief, 1539
vent lines, 793
welding, extensive use, 1438
" Zipper " catalyst conveyor, 697
Refinery products, future, 1385
Refining:
absorbing ethylene in sulphuric acid, (P) 218

Refining (*contd.*):
Al, organic compounds, (P) 218
Al and Be, organic compounds, (P) 218
alcohols, (P) 218
aldehydes, (P) 218
from petroleum, making, 715
alkyl monochlorides, (P) 218
ammonia, 420
from cat reformer off-gas, 1318
batch fractional liquid–liquid extraction, 377
benzene preparation, (P) 213
bubble-cap columns, draining, 1072
*iso*butane losses, reduced, 1094
*iso*butylene:
reacted with oxygen, (P) 218
separation, 82
with H_2SO_4, 570
carbon black suspensions in oil, 580
CO–methane system, phase equilibria, 222
CO with H_2:
conversion process, (P) 83
converting, (P) 218
carbons, activation of, 229
catalysis for petroleum, 947
caustic alkali recovery, (P) 213
chemical engineering fundamentals, 184
coalescence of oil-in-water emulsion droplets, 579
coke, 1618
computor, electronic digital, 1078
condenser:
costs, 932
wall temperatures, cooler, 387
control requirements, 573
coolant, sea water, 557
corrosion inhibitors, molecular weight, 1150
costs, allocation, 123
crude oil to ethylene, 810
cumene and tetramer production, 739
cyclones, wet, 1532
de-acidifying ammoniacal wash waters, (P) 213
dehydrogenating hydrocarbons, (P) 218
dehydrogenation:
by the Houdry process, 568
cat, (P) 218
dephenolization, oil, 1109
desulphurization of petroleum distillates, catalytic, 713
desulphurizing:
middle distillate fractions, 1085
process, (P) 81
development during Stalin's 5 year plans, 54
diesel fuel, desulphurizing, 712
Dowtherm systems, 1217
dust separator, (P) 81
ethanolamines, gas cleansing and purification with, 809
ethylbenzene, 214
ethylene:
manufacture and distribution, 569
oxide, (P) 218
yield, increasing, 716
European capacity reviewed, 521
filtration, 419
rolling and drawing oils, 567
flame temperature, instantaneous measurement of luminous, 824
flash vaporization and ASTM distillation data, correlation, 1076
flow, more data on 2-phase vertical flow, 583
fluid dispensing system, (P) 64
fluidized bed reactors, mixing in, 582
" Four-in-one " processing, 686
fractionating fundamentals, 372

Refining (*contd.*):
fractionation, multicomponent, 1104
fluidization velocities, fast estimates, 1071
gas:
ammonia synthesis, 215
cleansing and purification with ethanolamines, 809
hydrocarbon synthesis, (P) 218
stream, sep solids, (P) 81
synthesis, (P) 218
gas oil, recovery, (P) 68
gases, process for rotating, (P) 191
gasification of solid carbonaceous material, (P) 218
granular solids, conveying, (P) 64
Guldberg rule, corrected, 228
heat:
efficiency, low cost, 1081
transfer:
in packed beds, 185
performance curves, 966
n-hexane in liquid phase, volumetric behaviour, 836
Houdry dehydrogenation, economics, 717
Houdry process, 568
hydrazine, (P) 218
hydrocarbon:
mixtures from gases, producing, (P), 83
sulphonyl chloride, (P) 218
synthesis gas, (P) 218
hydrocarbons:
from CO and H_2, process, (P) 83
from CO-containing gases, (P) 83
synthesized, (P) 218
hydrodesulphurization:
at Stanlow, 1444
of gasolines, 212
process upgrades fuels, Gulf, 1316
hydrofining:
improving distillates by, 1330
naphthas, 816
hydrogen production, 571
Hyperforming process, 794
ignition of gaseous mix, spontaneous, 221
instrumentation, U.S. conferences, 577
ketones, (P) 218
and cyclic alcohols, (P) 218
kinetic data, precautions, 1097
lead sulphide sweetening process, (P) 81
liquid hydrocarbon, mixing simplified, 928
liquid in pressure reactions, process for rotating, (P) 191
liquid–liquid:
equilibria, 1226
extraction, 822
liquid phase reactions, 825
low temperature phase equilibria, 807
M.E.A. breakdown, 1216
mercaptan removal adds two octanes, 550
methane conversion with oxygen, 814
molecular "sieves" for separation, 1087
naphthalene-1-octadecene, vapour–liquid equilibria, 223
new Unisol unit, 955
nitrogen–hydrocarbon systems, 808
organic materials for radiochemical users, 1101
O_2-containing compounds, (P) 218
oxidation of used oils, 1564
paraffin–olefin mixture, (P) 218
n-paraffins liquid-state equation for, 227
phenols:
and thiophenols, removal, (P) 81
Refining (*contd.*):
phenols (*contd.*):
removal from aq sol, (P) 81
pipeline blending, automatic, 59
pitch, solidifying, (P) 81
plates:
efficiency and pressure drop, 1541
fast methods for minimum, 1540
plate-to-plate method, 553
pressures in closed products system, 1202
process:
analysers, 1093
handbook, 182
processing:
low temperature, 710
modern combination, 1308
of NH_3-aq containing H_2S, (P) 213
programming, linear, 1307
progress, mechanical engineering, 181
*iso*propanol, (P) 218
propylene oxide, (P) 218
pyrolysis of C_3 and C_4 hydrocarbons, 226
reactions, liquid phase, 578
recuperators, metallic, 378
reducing residual oils, 694
regenerating cat soln, (P) 213
regeneration of high capacity cation exchanger, H_2SO_4, 211
resistance to flow of liquids over solids, 581
Rexforming, 1222
100 O.N., 1088
sand surfaces, displacement of petroleum from, 225
scale formation, control, 188
Seitz process, 567
separating S compounds from combustible gases, (P) 213
separation:
of mineral oil–vegetable oil mixtures, 1112
problems, 1532
shale oil, 549
silica gel as drying agent, 1086
slime and algæ control, 933
sludge disposal, acid, 1533
sodium, use of, 711
solids–gas contacting, 1227
"Step wise" heat transfer calculations, 695
stream pollution, reducing, 418
sulphates mix, monoethyl and diethyl, (P) 218
sulphonation and sulphation, 216
sulphur:
English production, 714
extraction process, (P) 81
recovery, 392
sulphuric acid, English production, 714
tetramer production, 739
thickeners, 1532
treating facilities at Mandan, 687
tube still, pressure, temperature, and vaporization characteristics, 555
turnarounds, major unit, 57
Uniflux trays, 1310
Unisol stripper, new, 957
urea complexes, 1221
vacuum flashing, heavy fraction, 1331
vapour–liquid equilibria of C_7-hydrocarbon–furfural systems, 737
vapour recovery system, 381
vapours on finned tubes, condensing, 556
waste:
disposal:
at Mandan, 688
symposium, 391
water cleaned, 1534
water pollution, control, 1208
Research:
applicational, 1612
photography in oil, 590
Resins:
epoxide, surface coating applications of, 610
polyester, and glass-resin laminates, 1500
process, production, (P) 264
structure of oils and, 117
Road transport, *see* Tankers.
Roofing paper works, fire claim, 587
Rubber:
industry and petroleum, 609
synthetic, 1159
Rumania:
crude area, new, 915
pumping equipment, 325

Safety precautions:
analysis of accidents in oilfields, 520
fire:
alarm for bitumen, tar, and roofing paper works, 587
at Grangemouth, 519
fighting equipment, 122, 282, 582
protection, automatic, 1255
research, 525
ground connexions, 1017
industrial hygiene, 1611
lighting in hazardous atmospheres, 529
nuisance control and U.K. refineries, 517
oil jetty foam monitor, 518
petrol fire extinction, 277
pressure vessels, 1074
programme, completely decentralized, 750
sulphur, an explosion and fire risk, 1018
surges, preventing damage from high-voltage, 682
Saskatchewan:
structure, Coleville–Buffalo Coulee area, 11
wildcat, 135
Saudi Arabia:
Abqaiq, pressure maintenance, 776
drilling record set, 1269
Sea water as industrial coolant, 513
Seismograph, reflection, 657
Service companies, 1388
Service company, role, 1022
Shale oil:
Colorado, entrained-solids retorting of, 1142
Estonian, gasoline composition, 608
gasoline, stability of, 843
production and refining, 549
Sicily:
field expands, 1278
oil in, before the 20th century, 1188
Ragusa field, production, 914
wells producing, 172
Sludges in engine oils, 1350
Sludging, oil additive to control low-temperature, 1134
Smog:
cost of fighting, 526
while saving product, cut, 381
Softening point apparatus, automatic, 446
Soils, plasticity index and pH of, 1324
Solids concentration, 1576
Solvent refining:
benzene and toluene extraction, 563
bituminous coal, Sulcis, 201
columns, pulsating, 943
dewaxing:
lub oils, (P) 202
mineral and tar oils, (P) 202

Solvent refining (*contd.*):
dewaxing (*contd.*):
petroleum oils and tars and their dist, (P) 202
solvents, higher ketones as, 707
dialkylbenzene isomers, sep of mix, (P) 71
extraction:
operation, 399
process, (P) 71
furfural extraction, 101
hydrocarbon separation by liq–liq extraction with benzyl alcohol, 141
hydrofining, 401
law relating to, 882
leaching, 200
liquid–liquid extraction, 70, 400, 944
lube oils, 1210
n-paraffins from gas oils, 1080
paraffins, separating high-m.p.,(P) 202
Podbielniak centrifugal extractor, 199
scrubbing:
naphthalene from gases, (P) 202
process for H_2S from gases, (P) 202
selective process for tars, coal extracts, hydrogenation products, etc., (P) 202
xylene isomer mix, separation, (P) 71
South America, developments (1953), 29
Spain:
drilling at Castilfrio, 535
Oncala anticline, test drilling, 536
sedimentological publications, 1415
Spectrometry:
infra-red in analysis of mineral oils and greases, 973
mass, 1333
Spectroscopy:
in the oil industry, 1105, 1575
infra-red in quantative analysis, 974
Spirit, sweet petroleum, 504
Standardization, mineral oil and fuel, 530
Storage:
coatings for underground tanks, organic, 175
container, (P) 180
DIN standard, new draft, 51
emergency systems, 49
farm lay-outs, 364
gamma-radiography of installations, 362
gas in depleted reservoir, 369
inflammable liq, (P) 53
liquids and gases, 368
losses, standards, 1302
microballoons, phenolic, 366
operation alpha, 363
protection of machinery in, 484
tanker discharge, 926
tanks:
cleaning and descaling, 1376
gas-free, 679
gauging, remote automatic, 365
interior, preparation, 1375
positioning on hilltop, 50
preventive corrosion, 876
protection, 1056
rising cost, 922, 1055
standardized drop fuel, 921
underground, 367, 924
Street planning, 1590
Streets, development of town, 734
Styrene, faster hydrochlorination of, 1362
Suez Canal, movements of petroleum, 923
Sulphur:
deliveries, liquid, 361
from petroleum, 1007
removal, 1316
Sulphonates, aryl alkane, (P) 265
Surfactants, non-ionic, 1501
Sweden, sedimentological studies, recent, 1411
Switzerland, exploration, 285

Tankers:
and world shipping, 1057
berths at Singapore, 680
road, 371
sulphur deliveries, liquid, 361
surplus increases, 544
Tanks, *see* Storage.
Tar:
analysis:
colloidochemical, 1594
of coal, colloidochemical, 1005
chromatographic separation methods, 1139
coal:
colloidochemical analysis, 605
neutral constituents from low temperature carbonization, 870
cracking, hydrocarbons in coke- and iron-ore furnaces, 607
development of road, 495
distillation, 604
fire alarm, 587
hydrocarbons, cracking, 607
neutral constituents of low-temperature coal, 1128
oils, emulsions, stable aq, (P) 258
pitch:
nature of coal, 1004
producing, (P) 110
synthetics from, (P) 270
smell development, 1130
synthetics from coal, (P) 110
products and their use, 603
road:
ageing stability, 1591
development and properties of VT-, 1357
distillation processes, 1358
roof, heat effects, 732
roofing paper testing, 601
"Terylene," large-scale manufacture, 811
Testing instruments:
charcoal weight test, 1110
for determining ageing resistance of lub oils, 584
poise-meter, 1113
rapid, for gear oils, 969
temperature, for −325° F, 978
T.E.L.:
plant, integrated, 105
stabilized, (P) 239
Tetramer production, 739
Texas:
Big Mineral field exploitation, 672
Boling salt dome, 5
Cambrian:
pay, 130
trend, Coke and Nolan Counties, 168
Dora Roberts trend, 886
Ellenburger production, 885
exploration, 1263
Floresville–Stockdale trend, 1165
fracturing boosts production, 164
gas reserves, 1300
geophysical problems, 308
Gulf Coast, abnormal reservoir pressures, 131
Hastings field, 1042
Muldoon development, SW., 1162
offshore strike, 127
oil:
accumulation, 1510
from every age, 1265
resources, 1262
Panhandle, paleogeology of, 1393

Texas (*contd.*):
pipeline mileage, 1525
pre-Permian zones, discovery, 1264
recovery boosted with high-pressure gas, 163
salt dome's new phase, 627
Sandusky field, 1175
Sara—largest Devonian structure, 129
Slick–Wilcox field, 1430
Spraberry:
approach, new, 540
formation, genesis and depositional history, 630
Strawn sands production, 629
strike, Dora Roberts ranch area, 128
Vealmoor field, 1174
well fracturing effect on water flood, 1184
Woodbine cores, 1424
Transformer:
behaviour, 498
inhibited, 499
insulator, 500
oil, 1131
regeneration, 503
stability, 263
testing, 724
Transport:
boiler, Dyson, 1518
crude, 1524
fuel, economic characteristics, 1189
gas flow calculations, 1191
movements of petroleum through the Suez Canal, 923
of liquid asphalt, 925
problems in international petroleum economy, 916
shipping, larger unit loads, 1529
tanker discharge, 926
See also Pipeline, Storage.
Trinidad:
Barrackpore–Wilson oilfield, 1187
test spudded, 136
Trombay Is., new refinery, 938

U.K.:
carbon black plants, 741
oil in coal measures, 15
research, fuel and power, 1387
Vacuum's new grease plant, 1124
Uranium:
-bearing minerals, 1024
with associated hydrocarbons, relationship of, 624
U.S.A.:
coke capacity, 1618
Continental Tertiary deposits, 637
discovery in SE. States, 287
economy, influence of petroleum and natural gas, 280
gravitational surveying methods, 537
instrumentation conferences, 577
intermountain region, oil and gas, 9
Lower Silurian deposits, map, 761
Mid-Continent basins, promising, 531
oil imports and the coal industry, 278
undeveloped provinces, 1031
west coast optimism, 676
U.S.S.R.:
Bashkir production, 1054
deposits, new, 1301
offshore oil development, 347
petrography of sedimentary rocks, 1416
science and technique in, 1279
seismographic development, 18
spanners, mechanical, 325
Utah:
Breen River formation, 765
Pennsylvanian stratigraphy, 641
Uinta basin, origins of hydrocarbons, 10, 642
Wasatch Plateau gas fields, 1401

V_2O_5, technical problems about, 1320
Valves :
  plastic, 1313
  silicon–iron, 1363
Venezuela :
  drilled, 3-miles deep, 342
  electrical equipment, oilfield, 328
Virginia, Bergton gas field, geology, 1392
Viscometer :
  bar, 1447
  cone and plate, 1454
Viscosity :
  new, 456
  and electroviscous effect of emulsions, 90
  chart for getting vapour, 720
  equiviscosity index, 1351
  hydrocarbon gases under pressure, 151
  lubricants, importance of behaviour, 855
  measurement, new method, 962
  poise-meter, 1113
  thixoviscometer for production control, 457
Washington :
  Ferndale refinery, 795
  wildcats, 1402
Waste disposal, symposium, 391
Water :
  analyses, 1282
  drive process, 1178
  economics of softening cooling, 384
  for petrochemical plant, 383
  pollution, 1208
Waters :
  geochemistry of subterranean, 1281–2
  of the lower chalk, 1292
Wax :
  coating on cheese wrappings, 1360
  paraffin :
    emulsifier, (P) 264
    thermal differential analysis applied to, 841–2
  remover specification, 111
  solidifying process, (P) 95
Weeds, chemical control, 937
Wells, corrosion inhibitors for oil and gas, 1145
Williston basin, *see* North Dakota.
Wood impregnation with coal tar oil, 1129
World :
  deepest well dry, 1034
  oil, geological prospects, 622
World Petroleum Congress, papers at Fourth, 1238
Wyoming :
  Big Horn basin crude, 309
  Curtis sand development at Grass Creek, 543
  discoveries, three important, 295
  Grass Creek development, 543
  Shannon reservoir, production engineering, 1522
  water-drive field, analysing, 165

Yarns, regenerated cellulose, (P) 254
Yugoslavia :
  Bunjani–Popovaca–Gracenica–Sisak, crude pipeline, 788
  Croatia, problem of exploitation, 678
  gasolines, octane ratings, 1460
Yukon, Mackenzie basin geology, southern, 650

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